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ABSTRACT

This report proposes a design for teacher training, and for research and development in teaching and learning, that seeks to capitalize on the diversity and adaptivity of teaching and learning in the real world. Chapter I provides an overview of teacher education in the context of educational concerns at large. It discusses the processes of teaching and learning and the ways in which they interact with curriculum and student characteristics. Speculations are offered on the future of teacher education and research in teaching. Chapter II deals with research and development in teacher education in the 1960s. Various technological developments are considered--systems approaches, microteaching, protocol and training films, and flexible scheduling. Also discussed are humanistic reactions to performance-based teacher education. Chapter III considers the role of certain aspects of theory and method in teaching research. The final chapter, chapter IV, deals with the development and operation of a Systematic Teacher Training Model. (JD)

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A Systematic Teacher Training Model:

Part 1. Theory and Research in Teacher Education

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Program on Teaching Effectiveness

September 1977

U.S. DEPARTMENT OF EDUCATION
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INTRODUCTORY STATEMENT

The Program on Teaching Effectiveness of the Center for Educational Research at Stanford is a program of research and development on teaching funded in part by the National Institute of Education. The major mission of the Program on Teaching Effectiveness is to develop and test improved ways of teaching for both novices and experienced teachers. The Program is particularly interested in testing new ways of helping experienced teachers improve their work.

This report describes the conception of a systematic teacher training model, including treatment of the related research and development in teaching, the theory and method of the research, the "learning that" component of teacher education, and the practice component.

PREFACE

In 1972, the Basic Program Plan for the Program on Teaching Effectiveness (PTE) of the Stanford Center for Research and Development in Teaching described the design and direction of a "Model Teacher Training System (MTTS)." The major goal, as stated, was "to improve teacher effectiveness in performing tasks and filling roles required to enhance student achievement, motivation, and long-term aptitudes" (p. I-5). As then described, the system was to include six components, each of which was to be field tested and revised for eventual distribution and installation. The first component, (a) the training system design, was to consist of programmed materials for training specific teacher skills such as questioning, listening, and explaining; non-programmed materials of all sorts assembled in a Teacher Training Automat; various student aptitude measures; and an elaborate feedback system for improving teachers' knowledge about adapting instruction to individual student needs based on electrical feedback equipment located in the Center for Educational Research at Stanford.

The next four components were intended to provide specific elements for use in the overall system. These included (b) a curriculum in conflict reduction and group process strategies, (c) techniques of self-management for teachers and students, (d) reinforcement strategies for teachers, and (e) guides to the use of visual media in training teachers. The last component was (f) an assessment mechanism designed to provide procedures for evaluating and improving the system, based on teacher and student performance measures, while examining more general problems of assessing teacher performance at the same time (p. I-5).

One year later, PTE's Resource Allocation and Management Plan, dated February 26, 1973, detailed the on-going development of a somewhat modified version of this system. In brief, the conflict reduction and group process strategies curriculum, and the visual media curriculum were discontinued either because they overlapped with the efforts of other program work units or work of the Far West Regional Laboratory, or because they no longer corresponded to stated program goals. That is, the focus of the program evolved during 1972-1973 in such a way that, while development of the Model Teacher Training System remained the ultimate goal, a strong intermediate interest grew in conducting large-scale experimental research on teaching as well.

The plan for the MTTS as revised in 1973 consisted, then, of (a) clustering dimensions of teacher behavior into three basic domains--the cognitive, the socio-emotional, and the organizational--based on research conducted over the past 20 years, (b) a greater attempt to identify and incorporate into the system appropriate teacher training products developed outside the Stanford R & D Center, and (c) preparation for executing a large-scale experiment in teacher training (pp. 27-28). Efforts in each of these areas have since resulted in several R & D Memoranda (e.g., No. 116, "Teacher Training Products: The State of the Field," and Research

and Development Memorandum No. 147, "A Factorially Designed Experiment in Teacher Structuring, Soliciting, and Reacting"). Memorandum No. 116, which describes the catalog of teacher training materials compiled by the Program, also re-labels the Model Teacher Training System the "Systematic Teacher Training Model (STTM). The change of name was considered desirable because the concept of a "model system" too often implied an ideal, finished product--a system needing no revisions. This was never a goal of the project; in fact, the system was designed to be self-renewing and therefore never completely "finished."

The SCRDT-PTE Program Plans for 1974 and 1975 again detail the continuing development of the STTM, which was now intended to take the form of:

> a monograph outlining in detail the approach to teacher training that has resulted from the work of the Program on Teaching Effectiveness and of other programs during the past decade (Proposal for Continuation of PTE, revised, November 11, 1975, p. 19).

This changed conception of the STTM resulted in large part from the progress elsewhere in carrying out PTE's original agenda, including the STTM part of it. Many other organizations (e.g., the Far West Laboratory and its Minicourses), programs (e.g., the Protocol Program of the U. S. Office of Education and its protocol films and materials), and movements (e.g., the performance-based teacher education movement) brought forth many of the products and training procedures originally (and overambitiously) envisioned as the goals of the PTE Systematic Teacher Training Model. The PTE became acutely aware of these new developments in the course of its survey of available teacher training products--the survey that resulted in its monograph, "Teacher Training Products: The State of the Field." The new conception of the STTM, that mentioned above, was the result. The present monograph embodies that conception.

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Chapter I. CONTEXT AND CONCEPT: AN OVERVIEW

Teaching and learning are fundamental human functions, and one often promotes the other. These functions take diverse forms, they affect one another in diverse ways, and these ways evolve over time. We need not trace the history of civilization, or of education, or of psychology to affirm this view.

Yet, in all that has been said and done about teaching and learning, there is little evidence that this diversity of forms is acknowledged, much less studied, much less used. Every era has had at least one revolutionary new way to train teachers, to teach, to promote learning (Broudy, 1963). Each of these ways has been the "one best way" for a time. Until yesterday's panacea gives birth to tomorrow's, the teacher educator and researcher usually believe in one of the prevailing one-best-ways, or in the one that will emerge from more research.

This book proposes a design for teacher training, and for research and development on teaching and learning--a design that respects and seeks to capitalize on the diversity and adaptivity of teaching and learning in the real world. It thus offers a concept of teacher training that is evolutionary, not revolutionary.

We sometimes refer to our design as "a teacher training system" or simply as a "system." This terminology is merely a convenience that, we hope, does not offend. It is not a new idea to use the language of systems to describe teacher training activities or, for that matter, the functioning of many kinds of educational and social institutions. Nor is it new to recognize that such institutions evolve, or should. What motivates us is the belief that institutions, particularly teacher education programs, are rarely designed to adapt in a systematic way on the basis of experience gained through their own functioning, or even to detect the need for adaptation. Rather, they seem to bump along on their one-best-ways, increasingly unfit for meeting the needs of the times, until calls for reform are overwhelming. The old ideas are then revised, the next panacea is adopted, and the process begins again. It is as though a driver were to change course only when he hit something.

Teacher education programs must be designed to be self-corrective on a shorter time-cycle. And so must the teachers who are trained in them.

Teachers move from learner to learner, class to class, subject-matter to subject-matter, day to day, and year to year immersed in the flow of teaching and learning. As individuals, teachers are far more capable of adaptation to changing situations than are institutions. But individuals differ in their ability and willingness to adapt, and the press of institutions and of events deflates us all at times. Further, a teacher who detects a need for change may not always know what to do about it. The need for information arises during that day, not during the next summer or sabbatical leave. So a teacher training program must provide individualized, specialized, responsive support of teachers.

Finally, adaptation must be seen as a transactional process, and so too must teacher training. Teachers learn, and learners teach. We must not think of teacher training only as prior to, and not also as concurrent with, teaching. We must not think of teaching only as prior to and not also as concurrent with learning. To think in these ways is to ignore the principal source of information and inspiration for adaptive teacher training, namely, feedback from teaching-learning transactions. For we believe that a design for teacher education is better tuned to reality when preservice training programs benefit from experience with inservice training programs.

The term "adaptation" is not new in discussions of teacher education. Many approaches to training are described as adaptive, if they provide for feedback and revision. But that kind of adaptation may serve a fixed set of criteria. We reject the notion that fixed criteria can be established for all times, all places, or all people. The sense of adaptation we embrace is more akin to the concept of evolution: adaptation is a local phenomenon. Organisms adapt to local conditions, and the criteria of their effectiveness are local and variable. This kind of adaptation produces local specialization and uniqueness, not uniformity. The tortoises of the Galapagos Islands evolved to thrive in <u>their</u> environment, not in some generalized environment. There are as many kinds of tortoises as there are environments in which tortoises

live. There must be as many kinds of teachers as there are environments in which teachers teach. And teacher education must have the capability, or better the goal, of directing and supporting this diversity.

The thoughtful reader will by now have noticed that we use "training" and "education" interchangeably. Though improved teacher education is the ultimate goal, "education" is often too immodest as a concept. "Training" implies a more modest beginning. Whether our design for training is really generalizable enough to cover all of what is meant by teacher education will be for the user, and the philosopher, to judge.

Having given this preamble, we can now elaborate the assumptions on which our design is based. It will be helpful to look first at the context, present and future, of teacher education and teaching. We can then consider details and how these fit the context.

Teacher Education in Context

Where is teacher education today in relation to other educational matters, and indeed to other social matters? Where will it be tomorrow? How are the basic ways teacher education functions, the problems it faces and its needs, similar and different in different localities in the U.S. and in other countries?

Education remains a fundamental concern of people everywhere. In recent times, unrealistic claims for its power to cure all social ills have been muted, partly as the result of better social science research on the "effects" of current variations in education. But the people's faith in their educational institution has not been seriously shaken by arguments that society should be de-schooled. A developed society requires a developed educational system. This proposition needs no elaborate proof derived from research. The system does not work as well as it should. It never has. But people continue trying to change the institution to make it work better.

Just how significant is education in the whole social system, and how important is teacher education in the educational system? We now realize that education needs to be seen in a more modest perspective, as only one of the great engines of democracy. U.S. education is a

reflection of U.S. society, not the main determiner of our society. Although education has its creative influence, it reflects the basic values and forms of our society, and can never operate far beyond them, surely never in fundamental opposition. But education remains one of our society's main enterprises. As of the mid-1970s, it has about 3 million employees, 59 million students, and an annual expenditure of $108 billion in the formal system alone, not counting the rapidly growing non-formal programs and those in industry and the military.

An enterprise of this magnitude and importance, long in formation, will not soon wither and disappear. It is also not likely to undergo sudden and radical transformation. Basic social institutions seldom do. Radical "breakthroughs," comparable to those seen in industry and medicine in past decades, should not be expected. But educational change, like social change in general, is anything but glacial. Recent generations have witnessed more rapid social and educational changes than in the past. Some of these changes have been planned and aimed specifically at improving matters. Others are in the nature of response to what occurs in other parts of society. And there is usually substantial lag in this response. Family patterns are changing in response to the contraceptive pill--a revolutionary invention in medicine. Similarly, school organization responds to a U.S. Supreme Court decision concerning segregation. And the many financial, social, and political pressures on the educational system often conflict.

A crucial question then becomes, What parts of the educational system affect most significantly the ways in which it functions? The main parts of the system are the physical plant, the finances, the personnel, the curriculum, and the organization. All will continue to be important. In the past, the U.S. has been preoccupied with problems of quantity more than quality:

--enough buildings to match our social commitment to free and required basic education for all, with opportunity in higher education;

--enough money to support the enterprise;

--enough teachers, administrators and other specialists to accommodate all students;

--a course of study for every subject matter field; and

--appropriate organizational structures, usually adopted from business and industry.

But as the school-age population has leveled off and begun to drop, attention has turned toward quality. Inflation, recession, and the competition of other social services have decreased willingness to spend for education. At the same time, students have exercised their powers as individual citizens, and the news media multiply this pressure. In adjacent issues of Time (March 3 and 10, 1975), one could read that

--a student in Florida brought suit against a university under a state law that requires public agencies to hold open meetings whenever they take official actions;

--a small town in Illinois created seven alternating styles of high school education within its one facility, with students making their own choices among them; and

--a student in Connecticut sued to recover tuition and expenses because she did not learn anything in her teaching methods course.

Increased demands for efficiency and accountability in education now accompany demands for choice and quality. The pressure for demonstrable improvement in education continues to rise. A main focus of this pressure, and one of the most strategic places in which to attack the problem, is the domain of teacher education. The largest share, between 75 and 85 per cent, of the education budget goes for teacher salaries. As the teacher goes, so goes the classroom.

Even with well-designed curricula, excellent facilities, and skilled administration, effective education cannot be provided without effective teaching. What goes on in the classrooms, in the interaction between learners and teachers, continues to be the heart of the educational process. It follows that any significant improvement in education through the school system must attend to the selection, training, and continuing development of the teaching staff.

The centrality of teachers and their education may be noted in the development of the educational R&D system over the decade from 1965 to 1975. At the beginning of that decade only two of the federally

supported Educational R&D Centers and Regional Laboratories addressed themselves directly to the problems of teaching and teacher education. By the end of the decade almost all of them were devoting significant attention to these problems.

The argument concerning the centrality of teachers and their education has a long historical basis. It appears not to be confined to one country. Teacher education is a problem at every level of the educational enterprise and in every society.

Over the past decade, teachers have begun to be masters of their own professional fate. On April 11, 1962, the newspapers headlined a one-day strike of New York City teachers. This strike, one of the first, was symptomatic of an urgent need for greater self-determination and self-regulation in the teaching profession. The idea of striking, of withdrawing services, even to remedy deplorable conditions, was considered repugnant even among the teachers on strike at the time. It was regretted on all sides that teaching circumstances should have deteriorated so much as to force such desperate action. The sobering question was whether a more workable alternative could be found. The strikers were roundly condemned from every side.

A decade later, teacher strikes across the country made the strike of 1962 seem puny. Now, however, the attitude of teachers and the public was quite different. In reviews of educational events in 1975, the New York Times and the Christian Science Monitor viewed these strikes as signaling that a professional teacher had emerged: better trained, surer of his or her professional competence, and unwilling to live with unreasonable restraints and conditions which prevented the exercise of that professional competence. It is unfortunate that strikes continue to be necessary, but they signal a new level of professionalization in teaching.

This growing professionalization has been accomplished by a recognition of the need for improved inservice training and for working conditions that will allow such training to be effective. Like other professionals, teachers strive for excellence, are self-critical, and

seek exchanges of ideas. Ill-trained teachers are seen to diminish the profession of teaching. While responsible ultimately to society, professional teachers seek their own means of recognition, development, and discipline. Teachers increasingly devise and control such mechanisms in their own profession. And continuing education plays a central role in this process.

Teaching and Learning in Context

The processes of teaching and learning are studied in many disciplines. But none devotes more intensity and resources to that study than the discipline of psychology. Hence, we need to look at the psychology of teaching and learning in context. Over the past decade, educational psychologists have learned to ask new kinds of questions about teaching and learning in schools. A cognitive psychology has emerged. It emphasizes the structure and process of mental events, and the complexity, individuality, and situationality of human interaction with environments. It goes beyond the traditional objectives of experimental and correlational research in education. The traditional view addressed questions such as "Which teaching method is best?" "Which people make good teachers or learners?" and, more recently, "Which teaching competencies are most important, and how can we best train teachers in them?" A good deal of knowledge has been gained through research on such questions, and they are still heard, stated in an absolute way as though we could count on generalizable answers.

Interaction Effects

But the most important new idea to come from this work--one that is fast becoming basic to contemporary cognitive psychology--is that the answer to such questions is, "It depends . . . ." It depends on the characteristics of the situation, the task at hand, the individuals involved, the educational objectives, and the details of the interactions among all these characteristics.* Learning is an active, exploratory

*Interaction refers here to the dependence of a relationship between two variables on the value of a third variable, or additional variables.

process affected by these interactions. And so too, we would add, is teaching.

Furthermore, these characteristics are not only in interaction, they are in transaction. That is, situations and people change in the process of interaction. As the world changes, so do the answers to traditional questions. Thus, in one important sense, there are not likely to be practical solutions applicable across problems, across people, or across time. In the natural sciences, such as classical mechanics, general principles are strongly established. When these principles are used to solve practical problems, such as the construction of a bridge, the solutions must combine several principles in unique, interactive, patterns. Two bridges are seldom identical. Solutions to real educational problems must also seek to combine generalizations in unique and interacting ways.

This interactive character of practical solutions poses two difficulties for research and for basing prescriptions for practice on research. The interactional complexity of educational (as well as physical) phenomena taxes the design capability of traditional research. So the research findings are always generalizations of limited validity, when applied to real-life, non-laboratory situations. They may or may not apply in a slightly different situation from that in which they were first identified, because all the influential variables can never be controlled in the real-life settings of education as they can be held constant in the laboratory. In principle, the same limits to the applicability of laws hold for both the natural and the behavioral sciences.

It follows that we can never be sure that any list of teaching competencies or any approach to teacher training will be exactly applicable across teachers, teaching situations, learners, or times. Such competencies or approaches can merely suggest promising solutions. We must then pursue local validations of evolving systems. This means that no two local teacher training systems will be exactly alike, or should be, just as no two bridges are alike. It also means that

formative evaluation will need to be a continuing, integral part of each system, just as bridges need some continuing inspection to insure their appropriateness despite changes in traffic and the ravages of weather.

Even if research on teaching does give us general principles, those principles will have to be applied in ways sensitive to new problems and possibilities. Research has given us some general relationships between the cognitive and other events involved in what we call teaching and learning. Examples in behavioral psychology are the effects of positive reinforcement on strength of behavior, and such processes as extinction, generalization, and discrimination. In cognitive psychology, the effects of meaning, structure, and mediating processes on memory are also well established. These help us form an outline on which a teacher training system might be structured. But the relationships will always need to be qualified as the characteristics of particular problems of teaching and learning are taken into account.

Skills, Strategies, and Styles

To be specific, consider a reading text. At any given instant, the learner is attending to cues on the printed page, storing information in memory, and acting to shift focus to new cues. At intervals in this process, the learner also reasons, or draws inferences, about the meaning of what is being read. And he makes decisions about continuing, reviewing resting, etc. An example of such processing cycles is shown schematically in Figure 1. A similar pattern might be sketched to characterize a learner listening to a lecture or participating in a discussion. Here the decisions and actions might take different forms: notetaking in the lecture, question asking in discussion, etc. The individual steps in such cycles are executed with more or less skill. Learners differ in attending, listening, notetaking, question asking, and other learning skills and habits. Also sequences of such events may be put together according to some plan or strategy. Some learners review at frequent intervals, some reason continuously about information received, some use mnemonic devices to aid memory, some pose problems for themselves or

others periodically. Others don't. Beyond these consciously employed strategies, learners differ in less intentional ways, i.e., in style. Some are rapid readers, some jump back and forth from idea to idea, some are methodical or slow. Some approach learning tasks highly motivated to achieve; some are characteristically anxious or doubting. Some rely on reasoning ability to compensate for their memory limitations, or vice versa.

There are, then, at least three categories of behavior distinguishable in learning: skills, strategies, and styles. Such categories shade into one another in some respects. But their separation helps to emphasize that learning is an active, diversified process in which the learner mobilizes a range of psychological predispositions and activities. Their separation also suggests the possibility that teachers influence several kinds of mental activities.

Teachers go through the same kinds of steps when teaching. Teaching and learning appear to be, in part, models of one another, and can be thought of as reciprocal or complementary models. Thus, skills, strategies, and styles also are three basic categories of behavior in teaching and in teaching-learning interactions.

The cyclical concept of teaching and learning derives from Tolman, through B. O. Smith (1960). In our work, schematic cycles of overt and covert teaching events have often been used to identify the skills needed, for example, in discussion with a learner. Figure 2 shows two time cycles, one representing a "moment-to-moment" stream, and the other, a "month-to-month" stream, of teaching behavior. One can imagine a teacher engaged in interaction with a learner at a given moment. The teacher listens for cues about some confusion faced by the learner, generates inferences about the source of confusion, decides on a course of action deemed appropriate, and proceeds to exercise skills of explaining or questioning intended to elicit additional cues.

But the moment-to-moment behavior is also guided by a day-to-day or month-to-month plan. The teacher has built up experience with this learner and others and has developed general strategies for diagnosis,

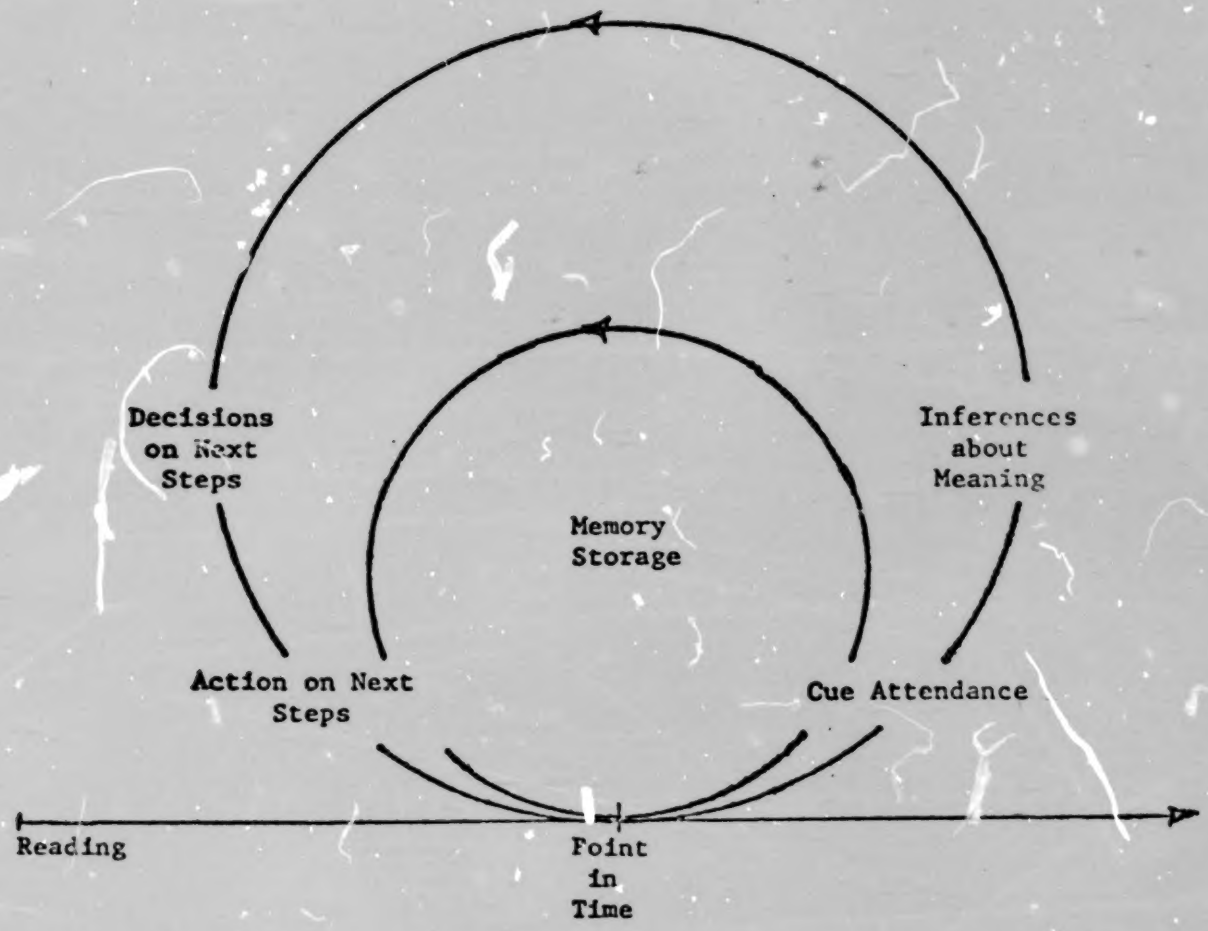

Fig. 1. The temporal course of cognitive events in a learner reading text.

instructional management, and reinforcement. The information available in this encounter is added to prior information in a growing evaluation of the learner's strengths and weaknesses. This diagnosis is used to plan instructional experiences for this particular learner and reinforcement strategies aimed at his particular needs and attitudes.

How such skills and strategies are manifested by a given teacher, or for a given learner, depends as well on the characteristic styles of the individuals involved. And individuals differ in skills, strategies, and styles not only from one another at some given time but also from themselves across time. Therefore, any given teacher-learner interaction, at a particular time in a particular context, is a complicated matter.

Teaching skills. A teaching skill is usually defined as a distinct and observable action performed by a teacher to help some learner achieve a specific educational objective. The performance of the skill implies that the teacher has relatively precise control over his or her behavior. There have been convincing demonstrations that such skills can be improved through focused training, as in microteaching (Berliner, 1969; Borg, 1972). Much literature in research on teaching also deals with the relationships between such teaching skills and student achievement. Studies reviewed by Rosenshine (1971) and by Dunkin and Biddle (1974) have dealt with variables such as teacher use of praise, use of student ideas, questioning techniques, probing, and structuring. Intuitively, we expect teaching skills of this sort to play an important part in teaching effectiveness. But the effects of any single skill should not be expected to be strong. The research results have tended to confirm this expectation. And almost no studies have dealt with combinations of teaching skills. Single teaching skills should be replaced somehow by combinations of skills in research on instructional performance (cf. Program on Teaching Effectiveness, 1976). And research paradigms must become more sensitive to the concomitant variations in style, strategy, and context that moderate the effects of these combined teaching skills.

Teaching styles. By teaching style variables we mean those aspects of a teacher's personal approach to the task of teaching which uniquely distinguish one teacher from another. Style variables can be loosely characterized as features of personality. Previous studies have been concerned with such style variables as "teacher warmth," "teacher achievement-oriented business-like behavior," "clarity," and "enthusiasm." Again, our intuition would lead us to believe that such variables have an important influence on student learning and attitudes. And again, we can find somewhat consistent but not strong correlational or experimental results which support this intuition.

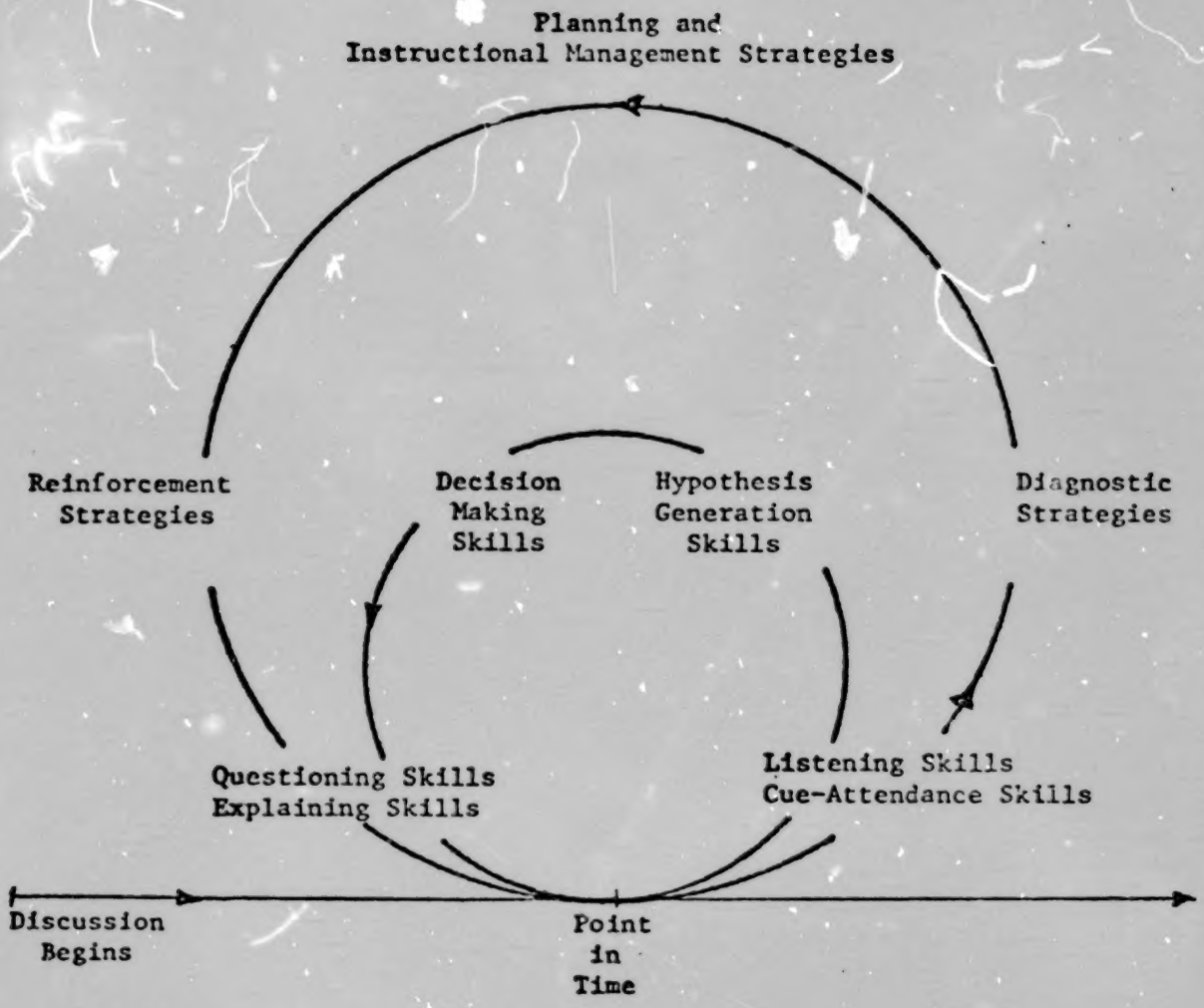

Fig. 2. The temporal course of teacher-learner interaction, showing the hypothesized cognitive activities of a teacher in moment-to-moment and month-to-month cycles.

Teaching strategies. By teaching strategies we mean well-defined orchestrations of sets and sequences of teacher and learner activities. Many of the teacher activities involved in executing a strategy are teaching skills as defined above. But the important difference between an aggregate of teaching skills and a strategy is that a strategy defines when and how teaching skills ought to be used and specifies both teacher and learner activities. Shavelson (1973) has argued convincingly that a teacher's decision as to how and when to use a given teaching skill is an important subject for further investigation. In a sense, a teaching strategy is a plan for decision-making. It serves as a guide to the moment-to-moment decisions and adaptations the teacher must make during the act of teaching. The sequence of teaching skills to be used is well defined in advance. Teaching skills that are unrelated to an effective use of the chosen teaching strategy are excluded. The teacher is free to decide the specifics of how a given teaching skill will be implemented or to adapt the overall outline to unforeseen events. Furthermore, because a teaching strategy specifies the activities of students, we avoid the pitfall of assuming that if a teacher merely fills the air with the right proportion of skilled teaching acts, then student learning will occur. We believe that students learn because of what students do. That is, students observe, read, hear, and think about the subject matter, talk about it, practice skills overtly or covertly, solve problems, memorize facts, etc. It is unlikely that any single teaching skill or style variable will directly and consistently promote these kinds of student activities. Small wonder, then, that the results of research on teaching which concentrates on single skill and style variables are so often contradictory or inconclusive.

It may be that a concentration on teaching strategies can fare no better. Since strategies are more molar units than skills, however, one might expect their effects to be less susceptible to moderation by stylistic and situational variables. Curriculum materials are often structured in such a way as to suggest a teaching strategy with which these materials should be used. Discovery teaching, didactic teaching, values clarification, teaching for inquiry, and role playing are examples

of the kinds of strategies with which the curriculum field has dealt. Often, however, descriptions of these strategies do not specify the teaching skills of which they should be composed. Thus, we find that the literature on teaching strategies developed by curriculum researchers also has shortcomings. One fears that low-fidelity versions have been used in studies of strategy effectiveness. And here also there is evidence that situational variables and student aptitudes interact with strategy variables.

Useful examples of teaching strategies were provided by Joyce and Weil (1972). They described sixteen teaching strategies (which they called "models"), each derived from a theoretical position or model in psychology, sociology, counseling, or other disciplines. If these models were used as the components of a teacher training system, they would need to be conceived as flexible and adaptive enough to take different forms in different contexts. They take such different forms in any case, whether or not we conceive of them in this way.

And this is the crux of the problem for research. No categorization of teacher or learner behavior will be adequate if it is based upon a simple view of the relationships between such behavior. The complexity of human behavior in this realm defies comprehensive description and analysis with univariate, noninteractive theoretical and research tools. We cannot hope to reduce the matrix of possible interactions among teacher behavior, subject-matter characteristics, student characteristics, etc., to a set of practical solutions true for all times and all places. (The same is true of practical solutions based on the laws revealed by the natural sciences.) Teaching and learning, and teacher education, just like engineering and medicine, need to be understood, developed, and used in tune with local contexts. Such applications of the biological sciences as, for example, the cure of malnutrition, must take into account the specifics of age, weight, body type, specific vitamin deficiencies, and hormonal functioning. Applications of generalizations about teaching must take into account the specifics of the teaching situations--such as teacher, student, and subject-matter characteristics.

The Future of Teacher Education and Research on Teaching

We can now extrapolate these views to formulate a portrayal of the future of teacher education and research on teaching. First, education will become more important in the future, and teachers will become even more crucial in this process than they have been in the past. Schools will probably alter their operations so as to become more intimately related to many other aspects of life. But they will grow in importance, enrolling more persons for longer periods than ever before. As technology develops, the roles of teachers will change but their strategic importance will not decrease. Teachers will require a much higher level of training if new technology is to be developed and used wisely. The best plans of men and their machines will continue to be easily wrecked by inadequately trained teachers. But the use of the new technologies can be optimized and complemented by well trained and dedicated teachers.

Second, technology will so alter our way of life that fewer and fewer persons will carry on what we formerly considered the productive work of the world, and more and more persons will turn to service occupations and will have greater leisure. The computer will become a major factor in education, handling the tremendous amount of record keeping and other clerical work necessary in school operation, and allowing flexible scheduling. In computer-assisted and other kinds of individual instruction, learners will use individual stations for not inconsequential amounts of time, especially to achieve some of the cognitive objectives of education.

Third, teachers will have substantially more time to work with individual learners and small groups. Students will have substantially greater amounts of time to learn individually and in small groups. Accordingly, the administrative structure of the school will be greatly altered.

Fourth, teaching talent will be used much differently. There will be differentiated staffing. The more highly qualified teachers will have correspondingly greater responsibility and authority. Teams of teachers with special training will work under the leadership of the more highly qualified professionals. Professional teachers may even hold a larger share of the top management positions in the educational system.

Fifth, this work force of professional teachers, though larger in numbers, will exhibit less turnover. New teachers will remain in teaching. There will be less need for a high volume of students in preservice educational programs to compensate for high turnover in the professional ranks.

Sixth, practicing teachers, schools, and professional organizations will take on more responsibility for inservice teacher training. School districts will be increasingly concerned with teacher selection and placement decisions, and with "vestibule" training, i.e., the training of new entrants into a school system.

Seventh, continuing education will come to be regarded as a natural, regular part of the teacher's everyday job. The scheduling of daily assignments will be planned to include this training function, just as, in many industries, a fifth of the work force is being trained at any given time.

Eighth, at the same time, there will be more diversity of opportunity for students and more local option in the form and content of schooling. As a result, teaching roles will become more diversified, and the description and understanding of teaching will become even more complex.

Ninth, traditional research on teaching, in which short experiments contrast a few alternative types of teaching in a few classrooms seeking broad generalizations, will give way to studies aimed at the development and evaluation of innovations in teaching in actual schools, on the one hand, and to analytic laboratory research on psychological and social processes in teaching and learning, on the other hand. Both of these newer forms of research will emphasize rich description as well as statistical inference.

These predictions lead to a conception of the role and diversity of teacher training in the world ahead--a conception that differs significantly from that of the past. In short, this consideration of teacher education in context leads us to ask, What should a teacher-training system be like to fit this context?

A Design for Evolutionary Change

We believe that the improvement of teacher education programs requires continuing, local, formative evaluation of, by, and for professional teachers themselves, in that local context. This in turn requires a conception of such programs as adaptive, evolutionary systems. It will help to elaborate here just what the term "evolutionary" implies.

Evolution is the shaping of a species, organism, or system by its environment over a long period. The more changeable the system, the more readily it will adapt, or "learn." This process can be seen in the evolution of a species, a society, or an individual. The highest level of evolution is not changing but increasing changeability.

Thus an evolutionary teacher-training system would have the capacity to learn how to learn (i.e., improve) in relation to its special environment.

But what would such a system look like? What should it contain? How would it work? It follows from our conception of varying contexts that there is no single answer to such questions. The content of teacher training will vary to a greater or lesser extent with the purposes and needs of a particular school district or teacher-training institution. No single monolithic program can, or should, be instituted in all of the far-flung teacher-training activities in this country or around the world. What we have endeavored to do is to specify the form of any training system, not its content. But we shall give examples of content and a catalog of training products from which a given training system might draw.

We believe that an effective training system must have seven components:

1. A means of selecting, describing, and placing teacher trainees --placing them in a program of training experiences designed to fit individual trainee needs.
2. A programmed sequence of basic training suited primarily to the needs of inexperienced teachers.
3. A nonprogrammed training component consisting of a collection of training products and experiences from which adjunct training experiences can be chosen according to the individual teacher's needs on a given day.
4. A laboratory or clinic in which teachers can practice recognized teaching skills and strategies or new methods of their own.
5. A means of assessing the progress of teachers through training and the adequacy of the content and sequence of training.
6. A means of revising the training content and sequence.
7. A means of counseling, assigning, and following up trainees after training.

We have envisaged a system to include these components. The system is not intended to be a comprehensive teacher-education program in the

conventional sense; rather, it could be used as a component of a full teacher education program. It is an organization of current knowledge and products useful in training teachers. The term "system" implies integrated elements, each designed to serve its function and to support other elements, not simply a loose collection of experiences. The system is intended to be self-sufficient and adaptive, containing its own evaluation and feedback mechanism. The basic evaluation mechanism for this purpose is an assessment component based on learning criteria. The system is exportable to other sites, but modifiable to fit the particular circumstances of each location.

Figure 3 shows a schematic diagram of the system for inexperienced or experienced teachers. Each major component is described in the following paragraphs. The operation of the system as a whole is discussed at length in a later section.

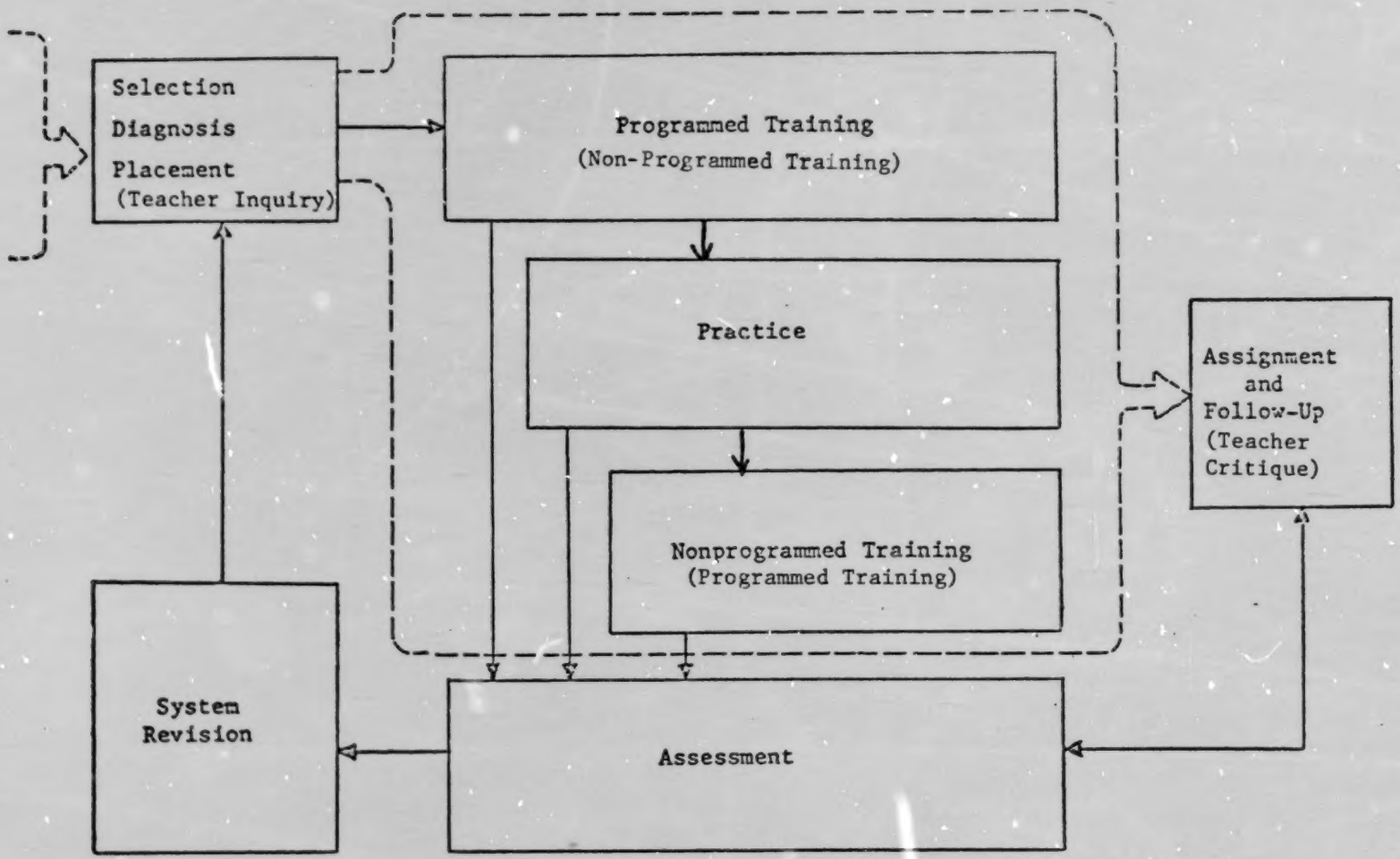

Fig. 3. System of training for inexperienced or experienced teachers: Schematic representation of the teacher training system showing flow of information (solid lines) and flow of inexperienced trainees (dashed lines) through the system. (Labels in parentheses indicate the form of the components when used for experienced teachers.)

Diagnosis

If a training system is to be helpful, it needs two kinds of information about the teachers it serves. First, it needs background information on teacher styles and characteristics, i.e., entry states. Second, it needs to detect the need for training.

The first kind of information is the more obvious and easily obtained. Entering trainees could be given printed and performance tests designed to diagnose their styles, strengths, and general training needs. On the basis of this information, the training system could be individualized in two ways: trainees would work primarily on their weaknesses, and different training methods would be used with trainees differing in aptitudes related to training. Since either beginning or experienced teachers might enter the system, a wide range of individual differences would be expected and encouraged. The procedure whereby trainees are placed in an individualized training sequence would include counseled decisions about future specialized functions of the teacher and his role in a differentiated staff. Studies of the validity of selection and placement measures would be conducted periodically as a regular part of system operation.

The second and more important need is to detect and diagnose particular training needs. The need for training and for appropriate detection and diagnosis of such a need can arise in several ways:

1. Some measure administered at the time of hiring or admission reveals an area of teaching that needs to be improved if the teacher is to be employed.
2. The teacher recognizes a problem in class one day and seeks ideas from the system on how to solve that kind of problem in the future.
3. A supervisor suggests after observing class that the teacher work on some particular skill or strategy.
4. A colleague makes a similar suggestion, or a group of colleagues agree that some new ideas they have, say, for teaching a new curriculum, or for team teaching, need to be tried out and practiced in a scaled-down or controlled situation.

5. A teacher decides to spend one free hour per week on continued education for general self-development or for improving knowledge and skill in a particular area.
6. A teacher seeks training to prepare for advancement to a new position or for teaching in a new kind of school or community.
7. A school system or state government legislates one or more new competence requirements.

There are probably many variations on these themes. But the system must keep track of the reasons for entry, administer performance assessments pertinent to these reasons, place the trainee in an appropriate sequence, and monitor progress. More discussion of this component--diagnosis--appears below in the section on assessment and system revision.

Programmed Training

A programmed series of training experiences would be planned for each trainee. Each element would have specified objectives or criterion levels to be reached. Trainees could be exempted from any element at any time by passing the test for that element, but could not proceed in the programmed series without reaching specified criteria. Some criteria would be specified in terms of student behavior. The programmed series might contain a standard set of competencies to be attained. This series might include (a) skill-training experience in explaining, listening, questioning, and the promotion of inquiry in students; (b) work on strategies of reinforcement for the development of achievement motivation and self-concept; (c) instruction in the management of group processes; (d) instruction in curriculum development in specific areas; (e) work on the development of personal and social skills; (f) laboratory experiences related to ways of handling classroom crises; and (g) training in the use of computer-assisted instruction (CAI), visual media, and other technology. When the system supports ongoing teacher training, however, a trainee might enter this set at any point, choosing to work on some or all of the standard sequences.

Nonprogrammed Training

For use by inservice teachers, and as electives for preservice teachers, other training experiences would be available in addition to the programmed sequences. These could be used at the discretion of trainees or as suggested by a supervising teacher working closely with the trainee.

The facilities provided for these purposes would include (a) appropriate students available for small group discussion or tutoring; (b) audio- and videotaping facilities for self-recording; (c) CAI for the trainee's own use; and (d) a "teacher-training automat" containing a large array of teacher training films, manuals, books, tapes, etc., indexed as a library. Trainees could pick and choose, browse, or be assigned specific activities by a supervisor. The automat would provide reading and viewing of material representing many alternative and "new" approaches to education as well as supplemental material related to other trainee experiences in the training system. In effect, the automat would offer a cafeteria- or library-style approach to training. It would function as a highly individualized resource available during short as well as longer breaks in regular daily teaching activities. It would be the means by which new teacher training products could be introduced into the system and tried out, without requiring disruptive changes in the training program. Also records of use of different materials would provide a kind of diagnosis of interest and needs for the community of teachers served. In these ways, it would be one of the major ways in which the system as a whole would detect and adapt to changing needs, new criteria, and evolving processes in other spheres of the educational enterprise.

Practice

In a real sense, the core of any training system is practice. In the envisaged system, there would be intensive teaching practice in three kinds of situations: tutorial dialogue, microteaching with small groups, and regular classroom teaching. Repetitive trials and detailed feedback, as in the classical microteaching laboratory, would be the main

vehicle for skill acquisition. Data generated in the course of practice would provide information for assessment as well.

Assignment and Follow-Up

Following successful completion of programmed work and practice, the preservice trainee would be ready for assignment. But his introduction to regular teaching duties would be gradual. Training might begin in June, with the trainee's first regular contact with students occurring in September, and his first solo classroom responsibility in January. He could begin to work with a team and would take some extra-curricular committee and supervisory duties. These supervised activities would provide on-the-job training. Further, the nonprogrammed training or "automat" described earlier would be available, so that problems and insights could be pursued individually with available training materials as they arose. The system might ultimately include also some regular contact with each trainee for the duration of his professional life, to continue system evaluation in terms of the career patterns of its products. In this way, a growing longitudinal conception of teacher professional development might be gained.

One can imagine other approaches to system use as dictated by local option. In inservice uses, particularly, variety is to be expected.

Assessment and System Revision

Data from tests, observations, trainee diaries, supervisors' reports, and analyses of tapes and transcripts would be gathered. These data would be used for both formative and summative evaluation purposes. Trainees would have access to all data. A computer record system would accumulate supervisors' observations and other data and provide regular summaries. Simulations as well as situational tests using real school situations would also be used for teacher assessment. Periodically, a summary of assessments would be made. All data would be used to judge the adequacy of the training and to revise the system on a continuing basis.

Here is perhaps the "heart," or better, the "brain," of the evolutionary concept on which the system is based. As noted earlier, a key concept in the training system has been adaptivity. First, the effective teacher should be an adaptive teacher with respect to individual

differences in learners. Second, the training system should be adaptive to individual differences among teacher trainees. Third, the system itself must be adaptive to its local setting, gathering formative evaluative information about itself for use in revision.

The first two senses of adaptivity are fairly clear. They point to problems in the development of training experiences but pose no real difficulties for the design of the system. The third sense, however, represents a fundamental design problem. How can the system be so constituted that it adapts to its environment and to changes therein? How can the system be made evolutionary in the same sense that evolutionary computers are now being conceived? We can identify here the kinds of information needed for assessment and the kinds of mechanisms needed for revision of the system on the basis of that assessment. A later section will deal with assessment in more detail.

Figure 4 shows nine sources of information pertinent to teacher assessment or system revision or both. Six of these kinds of information emanate directly from training elements in the system, and for each of these sources both teacher and learner variables provide data for use in teacher assessment. For system revision, four other sources of evaluative information are combined with the first six. These sources are provided by statements of need by individual teachers during and after training, statements of need by school or district officials in response to changing conditions or new problems, statements of need by a community control board, surveys of community views regarding current problems and practices, and finally, career-pattern surveys and follow-up studies on teacher trainees.

System revision can then take one of four avenues. First, selection and placement procedures are periodically reviewed and revised on the basis of regular validity and reliability studies. These studies investigate not only the overall prediction of success, but also the interaction of teacher aptitude measures with performance in alternative training conditions. On the basis of these data, measures are dropped, added, or revised. Second, the programmed training element receives similar periodic review and revision. While the training experiences

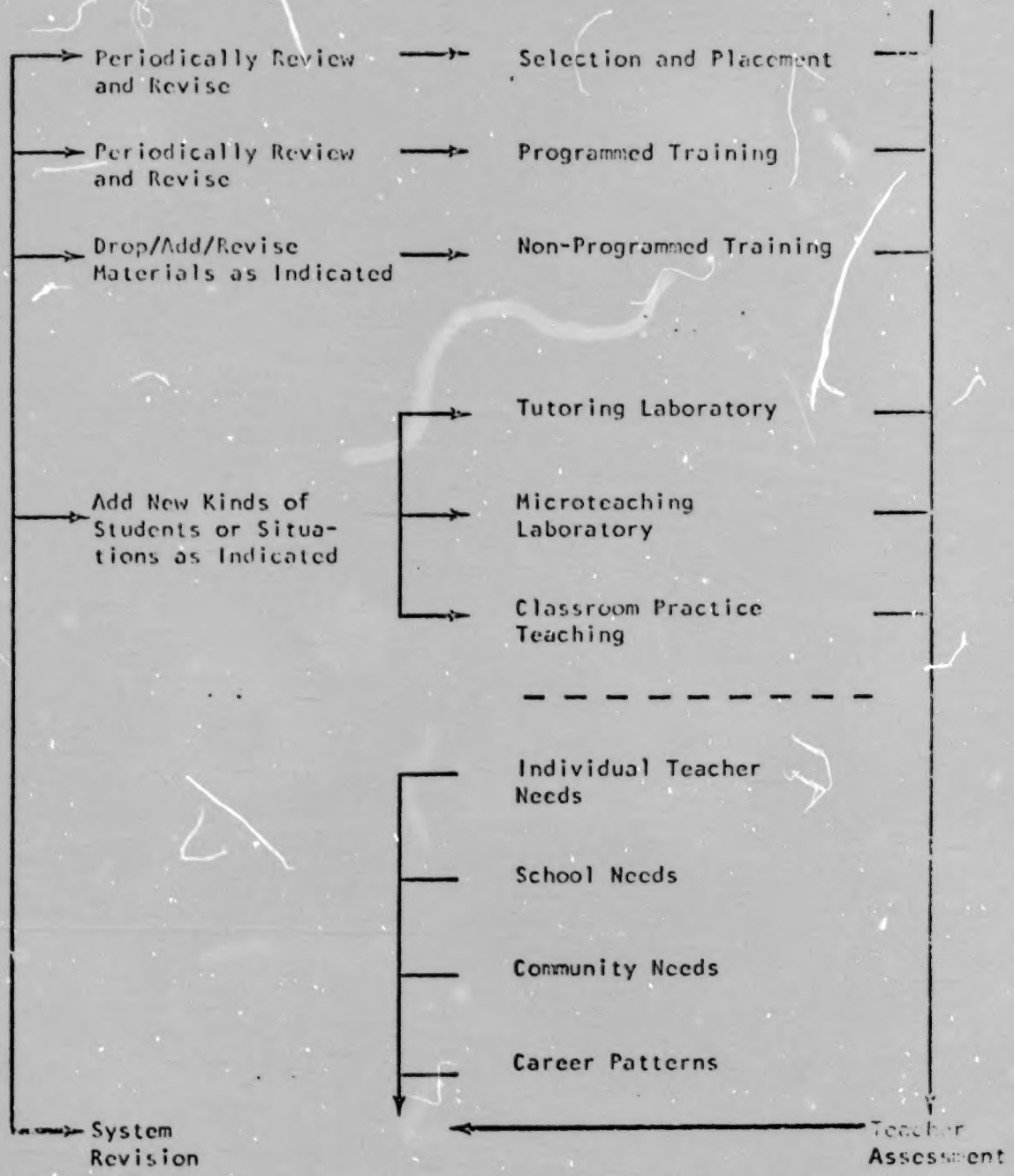

Fig. 4. Sources of information for teacher assessment and system revision.

that make up this element are not readily dropped, since their presence represents long-standing decisions on basic training needs, they can be constantly adjusted to find optimal combinations of basic training experiences. Third, the nonprogrammed training element is designed to be more fluid. Materials are dropped or added freely as needs and preferences indicate. Revision is rarely undertaken except when source manuals are judged generally important enough for inclusion in the programmed training sequence. Fourth, the practice element, also conceived as relatively fluid, is revised by dropping or adding kinds of learners or kinds of teaching situations as the needs of individual trainees dictate. Again, the basic structure of practice is not modified, but its content is adapted to the needs of individual teachers as well as emerging school and community needs.

Thus, the assessment element operates continuously within the system. It serves a double function--gathering data for teacher assessment, diagnosis, and assignment, while turning those and other data simultaneously to the task of system evaluation and revision.

Here then is the system in whole. Many readers can stop here. But for those interested in details, for one reason or another, the following sections will deal with the history, theory, and practice underlying or flowing from the concept.

Chapter II. RESEARCH AND DEVELOPMENT IN TEACHER EDUCATION

Faculty in institutions of higher education whose main professional task is the preparation and retraining of educational personnel have developed a contemporary social consciousness and awareness of the changing needs of society. Processes in present-day society have become relatively collapsed in time and space. Teacher educators are attempting to respond in new and different ways to the needs of that society. (Higher Education National Field Task Force on the Improvement and Reform of American Education, 1974).

Past and Present in Teacher Training

We have already said that change in any social institution comes partly in response to changes in society. Just as we have speculated on the future of teacher education, so we can look now at teacher education today. If future teacher education programs will reflect social advances and developments still to come, then existing teacher education programs should reflect advances and developments already here.

Institutions that educate teachers do indeed reflect recent social advances. Teacher education has responded to research, to new technology, to urbanization, and to economic and other social changes. In short, teacher education in the United States is evolving.

This process of evolution, however, has not necessarily been linear, or even sequential. In some cases, new programs are improvements on those that went before. In others, modification does not mean improvement, but only a different way of proceeding.

In this section we trace a decade of evolution in teacher education. Figure 5 diagrams the major reforms in teacher education in America, beginning in the early sixties and continuing to the present. A description of each program or concept, of each response or reaction, follows. Concluding remarks relate current models of teacher education to the proposed evolutionary design.

Technological Developments: Their Effects on Teacher Education

Woodring (1975) has written an informative, up-to-date history of teacher education. According to this account and others (Tyack, 1974),

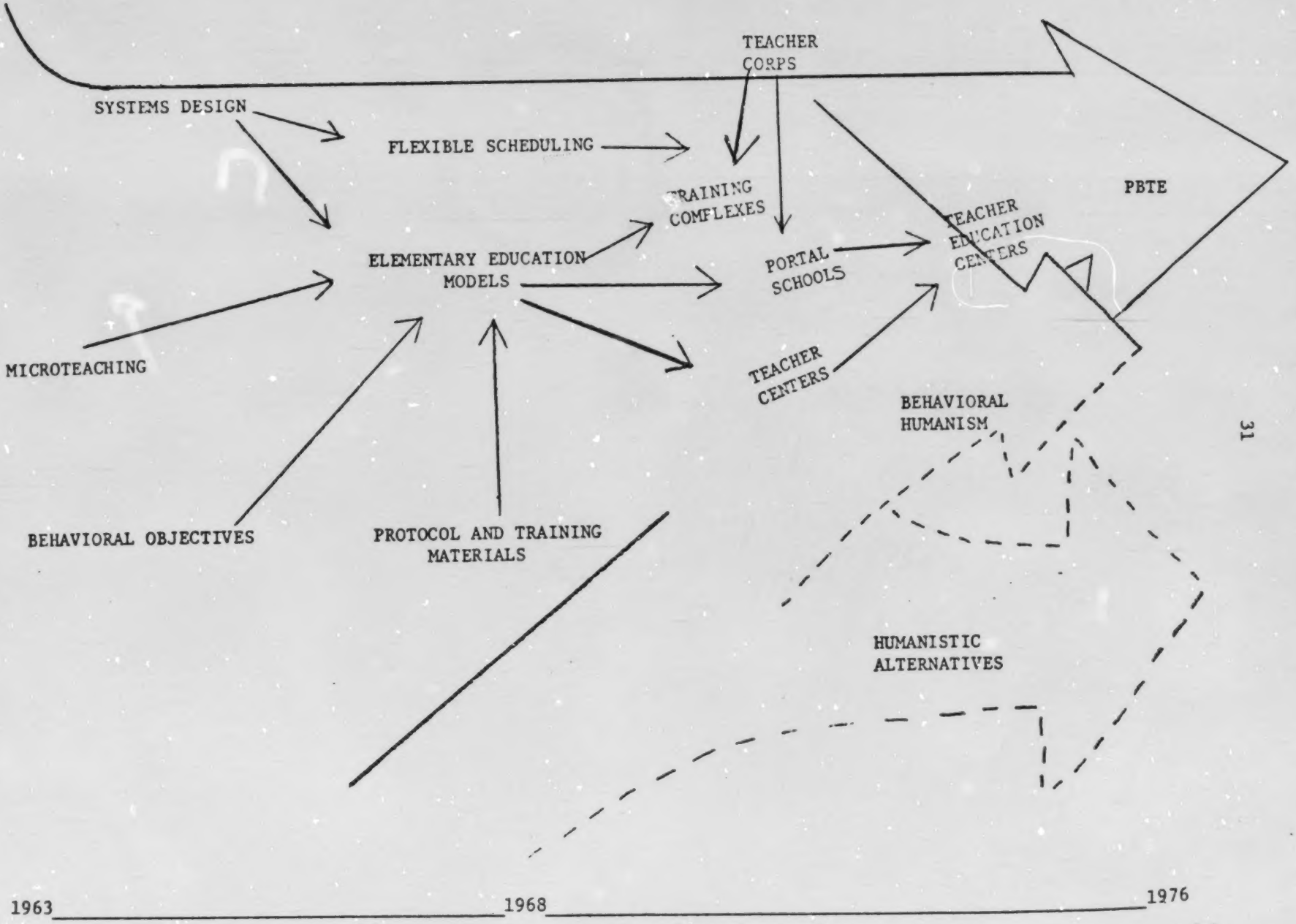

Figure 5. Schematic diagram of a decade of change in teacher education.

"experimentation and reform" began to characterize teacher education in the late 1950s (p. 20). As the time-honored standards of teachers' colleges and normal schools lost popularity, the field turned away from the "liberal education" of teachers and embraced a host of by now well-known innovations such as programmed instruction, teaching machines, and team teaching. Such early innovations often rose dramatically in prominence. But they usually proved short-lived as well. The evolution of teacher education gained momentum in the sixties. It was not ready to stop with one or two new ideas. Since real improvement would take time, more change was inevitable once it had started.

Technological developments. Technology, the application of science to the practical arts, had sifted into teacher education during the 1950s. Primary contributions came from research on military and industrial training. Job analysis (a sequential breakdown of complex operations into smaller elements) was found beneficial in achieving the objectives of military technical training (cf. Gagné, 1965; Morsh, Burgess, and Smith, 1955) in a way similar to early attempts to improve the evaluation of achievement through specifying objectives for education (Tyler, 1931). In industry, systems design, which depends on the specification of performance criteria for evaluation purposes, was rapidly gaining recognition as a model of efficiency and cost effectiveness (Folley, 1960; Meister & Rabideau, 1965). These technological developments were seen as logically applicable to training in education, and movements to implement them came from various sources (Gagné, 1962; Lumsdaine, 1964; Stolurow, 1961; Glaser, 1962).

During the sixties the videotape recorder became available as a mechanism for providing instantaneous visual feedback and knowledge of results in training situations (Cogan, 1963; Biddle, 1967). Educational television had been previously used for disseminating lectures and other types of instruction to the home, but the idea of using television as a teacher-training as well as a teaching tool was a new and promising one, which took a strong hold in teacher education (Bosley & Wigren, 1967). Research evidence supporting social learning ("modeling") as a powerful means for changing behavior (Bandura & Walters, 1963) almost required that educators take advantage of television's increasing popularity (cf. Report of Special Group D, 1955).

Additionally, advances in computer technology presented innumerable possibilities for use in education, not the least of which included increased accuracy and efficiency in scoring and recording test data, student records, and data analysis for research (Licklider, 1962). Efforts were made to act on these advances in the areas of programmed instruction, teaching machines, and computer-assisted instruction (see Holland and Skinner, 1961; Glaser, 1965; Lumsdaine, 1964; W. H. Allen, 1960; and Atkinson & Wilson, 1969).

These technological developments influenced teacher education in five major areas: use of behavioral analysis and performance criteria in teaching; the systems approach to teacher education; microteaching; protocol and training materials; and flexible scheduling. We shall describe each of these briefly.

Behavior analysis and performance criteria in teaching. The view of teaching as a complex of behavioral skills gained momentum from the early successes of programmed instruction and behavioral objectives (Brooks, 1967; Flanders, 1965; Gage, 1963; Gagné, 1965; Mager, 1962; B. O. Smith, 1960; Zimmerman & Zimmerman, 1962). Research on teaching digressed from the examination of teacher characteristics or properties (e.g., personality, IQ) that might affect learning and began to look at teacher process variables (actual behavior, such as questioning, listening, and explaining). This research focused on classroom observation--often of "master" teachers designated superior by administrators or students--and recorded the various behavioral "ingredients" of teaching. Each ingredient was then correlated with student performance measures to assess the differential effects. The intent was to discern a host of teaching "competencies" positively related to student achievement--competencies that could be advocated as "effective" and incorporated into teacher education programs.

Fortunately or unfortunately, the correlational research turned up no teaching competencies that could be promulgated for teacher education with great conviction. Some researchers attributed inconsistent findings to a lack of theoretical guidance. Gage (1963), for one, examined the paradigms that had guided past research and had been suggested for future effort. Despite these problems, early research on teaching and

teacher education did sort out complex classroom interactions (cf. Wallen & Travers, 1963) and clarify more subtle aspects and responsibilities of teaching..

As Gage (1972, pp. 146-147) has indicated, some "substantive results" of research based on learning principles found their way into teacher-education programs of the sixties (e.g., reinforcement of behavior that reflects progress toward achievement of instructional objectives). The third edition of the Encyclopedia of Educational Research contained an entry on "Learning" written by Estes (1960). In that article, Estes held that results of psychological research had had little or no effect on classroom research or practice. In the fourth edition, the article on "Learning" by Glaser (1969), after noting Estes' earlier point, added that "after another decade has gone by, there is evidence to report that this gap is narrowing" (p. 726). More recent results of research on teaching, results identified by Dunkin and Biddle (1974) and others, are almost certain to receive a similarly more favorable reception in teacher education. The stronger the empirical evidence, the more important it is that teachers be alerted to the consequences (good or bad) of what they do. Perhaps the greatest contribution of behavioral analysis to teaching is that it has made teachers and teacher educators alike aware of their potential effects on students. The effects can range from sheet imitative response via social learning (Bandura & Walters, 1963) to reinforcement of sex role stereotypes (Maccoby and Jacklin, 1974) and situations conducive to apathy or aggression (Lewin, Lippitt, & White, 1939).

On the other hand, the demand for established teaching competencies came rapidly and forcefully. The demand resulted from efforts to establish accountability and more strenuous certification requirements. Controversy over the proper purpose of performance criteria in teaching grew steadily (cf. Popham, 1967; McNeil & Popham, 1973). The question of whether performance criteria should be used for non-evaluative purposes (e.g., to improve the efficiency, cognitive level, and affective atmosphere of the classroom environment), or to evaluate teacher effectiveness (for purposes of selection and retention) has not yet been resolved (cf. Turner, 1975). Of significance, however, is

that the origin of this consequential issue lies in the efforts to analyze teaching that grew out of technological advances of the late 1950s and early 1960s.

A systems approach to teacher education. Saettler (1968) described the origins of the systems concept and its applications to teacher education. During the industrial revolution, systems "engineering" referred to the invention, design, and integration of an entire assembly of equipment, geared to the accomplishment of a broad objective. Early applications of systems engineering were made in the development of the atomic bomb and manned space flight. During the 1960s the concept was modified to describe "the interaction of men and machines within the context of an organization in terms of specific tasks and outcomes" (Saettler, 1968, p. 269). This set of ideas was to receive increasing attention in education: Education could benefit from a systematic approach to communication and learning. Traditional methods of education may not be the best there are. Education should abandon its primitive ways and seek to integrate with practice the theory and research of the behavioral sciences. This new way of looking at things was expected to help connect the "fragmented innovations" cluttering up education. The byword was efficiency; the process was cyclical.

The need for improved efficiency could be easily argued. Teachers were faced with classroom-management problems that reduced the time available for instruction. Classes were overcrowded. Resources and time were insufficient. Achievement test scores were declining. Parents blamed teachers, and teachers organized in self-defense. Increased efficiency was clearly needed.

The systems approach promised to deal with this set of problems. Educators developed and installed instructional systems (often monitored through computer-scored criterion-referenced tests), in which all components would operate to increase the quality and amount of classroom instruction per pupil. Such systems were embraced by pressed administrators and political groups. Under the auspices of the Office of Education, the National Council for Educational Research and Development

funded the educational R&D laboratories and centers, many based largely on a systems approach. Efforts of workers like H. Silberman, et al. (1964), Schutz (1970), and Gagné (1965) were channeled into the development of these "instructional systems." The systems analyzed the needs of individual learners in relation to the cost and planning constraints of procedures that could achieve behavioral goals.

These instructional systems shared some of the features of earlier programmed instruction (e.g., behavioral objectives, and sequential movement through text, based on learning principles). But the systems did not remove the teacher from the instructional process so the learner could work at his own pace. Rather, the teacher, as an integral part of the total system (Saettler, 1968), made instructional decisions based on learner needs and abilities, provided feedback, and controlled the amount and kind of instruction given. The systems required interaction between teachers and learners so that the learner could "pursue his own purposes" (p. 274) under the guidance of a knowledgeable and experienced person. In this sense, instructional systems lacked the rigid mechanistic patterns of conditioning inherent in programmed texts. They were interactive, rather than merely prescriptive.

The emphasis on the systems approach in the classroom led to the corollary that such an approach might also aid programs of teacher education, which suffered from similar problems (Ryans, 1963). Teacher education also lacked a "scientific basis" for its methods (cf. Gage, 1972), some of which were already being proven ineffectual (e.g., "practice teaching"; Matthews, 1961; Muuss, 1969). Teacher educators were reexamining their old ways; reform was forthcoming.

The systems approach, as it has been applied to teacher education, was outlined by Peck and Tucker (1973, p. 943):

1. Precise specification of the behavior which is the objective of the learning experience;
2. Carefully planned training procedures aimed explicitly at those objectives;
3. Measurement of the results of the training in terms of the behavioral objectives;

4. Feedback to the learner and the instructor of the observed results;
5. Reentry into the training procedure (a trial-teaching experience, for example);
6. Measurement, again, of the results following the repeated training.

According to Peck and Tucker, several studies have shown the approach to surpass the relative effectiveness of other less structured, less integrated modes of training. In general, the studies cited provide support for training techniques that get teachers to "specify objectives and teach to them" (p. 945) and those that give teachers "objective feedback about specific aspects of their teaching behavior" (p. 947). Perhaps the most powerful and promising feature of systems design is its built-in research-and-development function--one that can, through continuous trial and revision, bring about sound data-based innovation in educational practice.

As experience has accumulated, the systems approach has become more widely accepted. Further research in the area has been sponsored by private foundations and agencies of the federal government on a nation-wide scale. The concept has remained controversial in the light of its ties to military-industrial thinking and the early programmed instruction movement. Yet it has already made a mark on teacher education, and the evidence seems to favor its positive effects (Peck & Tucker, 1973).

Microteaching. Developed at Stanford in 1963 by Allen, McDonald, and Bush, microteaching is "actual teaching, scaled down." The class size is small; the lesson is short; the teacher's task is limited to the performance of one or two skills. Microteaching sessions are typically recorded on videotape so that the teachers can observe their own performance and then revise it. Where videotape recordings are not used, some other form of feedback (e.g., supervised observation, audiotape recordings) is substituted. The focus of microteaching is thus on controlled practice.

Unlike most other training techniques, microteaching has accumulated a body of favorable research data. This research, reviewed by Peck and

Tucker (1973), highlights one salient aspect of microteaching; it can serve as a vehicle for research on teaching. The variables of the teaching-learning situation (e.g., grade level of students, length of instruction, source of feedback) can easily be altered. The technique greatly reduces the complexity of classroom interaction for teacher-training purposes. While microteaching has limitations, it is a convenient way of providing pre-service teachers who have never taught before with "safe practice" (Allen & Ryan, 1969, p. 4), i.e., practice in nonthreatening situations, where real-life teaching problems nonetheless occur.

Furthermore, microteaching is useful as a tool for inservice teacher education. Allen and Ryan (1969) noted that "the greatest potential of micro-teaching lies in the kaleidoscope of opportunities" it can provide for experienced teachers (p. 77). Not only can it increase a teacher's ability to handle common classroom problems with wisdom and self-confidence, but by releasing the teacher from the rigid boundaries of "tried and true" methods, micro-teaching can also increase personal flexibility and openness to change. In a profession that must respond to change, flexibility is a highly important attribute. It is little wonder that microteaching has been widely adopted in the United States and in many other countries.

Protocol and training materials. Following behavioral analysis and microteaching, protocol and training materials entered teacher education. Protocol materials, as defined by B. O. Smith (1969), consist of "audio and video recordings of home, street, playground, and classroom situations, of committee meetings, and interviews" designed to represent "situations" of all areas and walks of life. These recordings reproduce teaching behavior to make possible the study of teaching at a level of detail previously unavailable (p. 52).

To be used for teacher education, protocol recordings must be classified by specific behaviors or attitudes to be discussed and analyzed for what is to be learned from them. According to Smith, the "identification, analysis, and sequential arrangement of behavioral situations" is a difficult task that must be accomplished with extreme care if "dependable knowledge" about teaching is to be acquired (p. 53).

Although protocols are the "objects" of study, they are not the "means" (p. 62). They can serve to illustrate and crystallize the concepts and principles of teaching, but they cannot be substituted for a theoretical framework or a way of thinking about teaching--one that integrates knowledge about psychology, sociology, and philosophy, as well as education. Smith provides a telling example:

> It is known that one's perception shapes his response and what he will learn. If the pupil's response is different from what is expected, the teacher should explore the pupil's view of the situation. The teacher will often find that the perceptions of children from poverty-stricken backgrounds are quite different from his own. For instance, a child whose life is filled with conflict may think of a labor strike in a very different way from the teacher (p. 63).

Like portrayals of any sort--movies, book reviews, footage of an opposing team on the football field--protocol materials can provide an extraordinary access to experience and insight. In addition, Smith believes that use of protocol materials in teaching will "increase the teacher's interest in theory, for he will see clearly for the first time that it is useful" (p. 63).

Training materials are defined as manuals, workbooks, simulation games, self-scoring test forms, and the like--anything that requires the user to make relevant responses, other than mere viewing, reading, or listening, and thereby fosters the learning process. Most such materials make some provision for feedback of performance information (Lumsdaine, 1962, p. 247). Materials of this sort have long been used to some extent in teacher-education programs. But the availability and quality of the various materials on the market have increased markedly in recent years as a result of teacher-training research and development. If a specific teaching behavior is found to be related to increased learning in students, an effective method of engendering that behavior in teachers is an essential next step (cf. Wallen & Travers, 1963).

Several sources have catalogued training products of all kinds (e.g., Spino, Berger, Tonges, & Abbott, 1972; Houston, et al., 1973; Stanford Program on Teaching Effectiveness, 1974). Some of these products have been evaluated and revised in actual training situations

(e.g., Millman, Popham, McNeil, & Baker, 1972; Miltz, 1971; Washington, 1971). A stellar example of research-based, field-verified training materials is the Minicourse series developed by Borg, Kelley, Langer, and Gall (1970). These courses are self-contained, self-administerable packages of teacher-training materials aimed at improving the teacher's ability to perform a relatively specific technical skill or set of such skills. Minicourses entitled Oral Language Skills, Tutoring in Mathematics, Discussing Controversial Issues, among others, have been developed. Products such as instructional improvement kits--and other materials developed by teachers in particular schools or school districts to handle situation-specific problems--have become available for programs of preparation for teachers.

Flexible scheduling. A unique, low-cost plan for improving high school education was introduced in the late 1950s by Trump (1959). The plan provided for individualized instruction in the secondary school by rearranging the traditional organizational plan to accommodate independent study and small-group interaction as well as large-group instruction. The plan was based on the assumption that changing societal demands called for emphasis on kinds of learning best achieved through individual study and small group activity as well as the more traditional kinds of instruction that were useful with whole classes and large groups. The secondary school, Trump argued, was locked into a rigid structure that virtually precluded any instructional strategy other than those useable by one teacher working with a large group of students.

Among several suggestions for improving the secondary schools with an eye towards the future, Trump (1961) presented the concept of flexible scheduling. A flexible schedule permits altering class size and time requirements to suit the needs of individual students and also allows varying the kind and amount of instruction given on each subject. A flexible schedule also accommodates team teaching and new kinds of curricula. Worked out with the aid of computers, the concept can provide better schedules at a saving of time and expense. Through ideas like flexible scheduling, computer technology found a place in organizing schools in ways that had implications for teacher education.

During the 1960s, the concept of flexible scheduling was employed in varying degrees by secondary schools throughout the country. Two examples of the concept's application in actual school situations were the New Design for High School Education (Bush & Allen, 1964) and the IndiflexS Model (Manlove & Beggs, 1965).

Bush and Allen outlined a "technical approach" (p. vi) based on the personalized diagnosis of student needs--an approach in which the computer played an integral part:

> As a school schedule becomes more varied to provide for new levels of individualization, the number of scheduling alternatives increases geometrically. What is an odious task under current practice becomes an impossible task without much assistance . . . if an eighty-period week is used for 1,800 students, it would take a computer capable of a million operations a second about 25 years to systematically consider all the alternatives possible for a single schedule (p. 5).

Bush and Allen examined the alternatives available to schools in using computer scheduling and recommended experiments in this area. The proposed design assumed that certain key subject areas would be taught through four types of instruction: independent study, small-group instruction, large-group instruction, and laboratory instruction. It assumed also that such interaction required highly skilled "senior teachers" and less highly trained supporting staff. Finally, the design assumed that class size, length of class meeting, and number and spacing of classes would vary according to the subject matter, type of instruction, and ability and interest of students.

On the basis of these assumptions, the Bush-Allen design treated the curriculum as an "area to be scheduled" (p. 21). This area could be divided into "modules" of instruction with wide variations in class size, subject matter treatments, and time allotments. The New Design encouraged experimentation with different patterns of course structure for different instructional purposes. Such experimentation can yield knowledge on the effects of instructional time on learning and the value of individualized instruction.

The IndiflexS Model, similar to that proposed by Bush and Allen and based on the same assumptions, also varied organization according to the

type and mode of instruction. In addition, IndiflexS utilized electronic data processing and high-speed computers to facilitate scheduling. Both methods have been implemented in actual school settings (Bush & Allen, 1964; Manlove & Beggs, 1965).

Bush and Allen noted that, in schools using the Stanford School Scheduling System, the general academic pace quickened, and 30 per cent of student time was spent in independent study. Discipline problems were fewer, and library circulation increased. Manlove and Beggs reported that schools using IndiflexS submitted positive, even enthusiastic, reactions. "Teaching," said the schools, "becomes a series of new experiences; expansion of the guidance role of students results in and adds to the teacher's studies" (p. 64).

The expansion of the guidance role and increased emphasis on planning--this movement towards individualizing instruction according to the student's unique abilities and needs--carried over to teacher education. To initiate and maintain a system of flexible scheduling, teachers at the pre-service level needed training in varied modes of instruction, counseling and supervision, needs assessment, group process, and team teaching. Teachers at the inservice level faced new roles as senior teachers in differentiated staffing patterns. They needed to orient pre-service teachers to the fresh experience of flexible scheduling. They also needed to update their own professional styles with new instructional methods and patterns of decision-making. These needs, established in part by the introduction of flexible scheduling in the 1960s, set the stage for many reforms in teacher education that are established and effective today. In addition, flexible scheduling emphasized the importance of conscious regard for cost--a seldom followed (cf. Jamison, Suppes, & Wells, 1974), but ever-present concern.

Social-Psychological Developments: Their Effects on Teacher Education

During the 1960s, new developments in the social-psychological realm paralleled recent advances in technology. The civil rights movement and the problems of urban living at times shifted concern away from the war in Southeast Asia to the domestic issues of inequality, poverty, and the plight of the disadvantaged.

Various efforts were made to improve the academic achievement of "deprived" children. Most of the programs fell short of their goals (see Beller, 1973). In the research literature appeared the Coleman Report (Coleman, et al., 1966), which questioned the efficacy of educational variables in improving achievement. Authors of case studies portrayed children caught in an academic vacuum that stifled creativity, bred prejudice, and wasted money (Kohl, 1967; Holt, 1964). Urban schools, in particular, were characterized by:

> The low academic achievement of many urban youth, the reluctance on the part of many teachers to accept assignments in urban schools with large percentages of minority students, and the growing controversy over issues such as corporal punishment and community control . . . (Green, 1969, p. 601).

Popular non-academic books highlighted these problems. Concerned educators and social analysts began to call for "analyzing and restructuring" the system (Green, 1973; Silberman, 1970; Report of the Detroit High School Study Commission, 1968).

The widely held theory of cultural deficit was one whereby these educational problems resulted from the fact that the culture of the schools differed markedly from that of the lower-class community. But critics replied that to judge the lower-class community to be "deprived" was to judge by middle-class standards. The purpose of the schools, it was argued, was not to acculturate but to educate. Their purpose was not to "assimilate children into an Anglo-conformist model," but to "equip children with the basic knowledge and skills they need . . . to survive and advance in the larger society . . . a society that is culturally plural" (Tyack, 1974).

These issues were alive in the sixties. Their vitality was contagious, and from them sprang a wave of educational criticism that spread through the mass media with great speed. Attitudes, the critics said, must change. Perhaps the place to begin was with teachers themselves (Smith & Arnez, 1969).

The problems of the urban schools required special teachers with special insights, and special proficiencies in handling complex social

class and ethnic conditions (Wilkerson, 1965). Programs like those outlined by Conant (1963) noted that teachers need special training in the instructional methods especially suitable for different communities and students. Conant's recommendations, however, were only a start. The concurrent work of Koerner (1963) retorted that teacher-education institutions (as they then existed) were actually incapable of such positive innovation. And so the criticism continued.

One program put forth to tackle the problem of urban education was the Teacher Corps Project (cf. Corwin, 1973). Begun in 1966 with federal support, the Teacher Corps was established. . .

> . . . to strengthen the educational opportunities available to children in areas having a high concentration of low income families and to encourage colleges and universities to broaden teacher preparation programs (Green, et al., 1973, p. 613).

The Teacher Corps program did apparently make advances in many of its target areas. But Green pointed out that the lack of systematic evaluation must inhibit claims of effectiveness (p. 613). Corwin, in addition, referred repeatedly to a high incidence of discouragement on the part of Teacher Corps interns, who were unable to reconcile differences between their own enlightened attitudes and the traditional ways of many local school districts.

Despite these and other problems, Teacher Corps grants are still being awarded today. Improvements based on evaluation data are being incorporated into new contracts. Moreover, Teacher Corps projects have made use of new ideas from other teacher-education programs developed during the sixties.

Applying the Technological Developments to Teacher Education

Three efforts of considerable scope sought to bring the new technology to bear on social-psychological issues facing teacher education: the idea that came to be known as competency--or performance-based, teacher education; the development of the Office of Education's Model Elementary Teacher Education Programs, and the proposed establishment of training complexes.

Performance-based teacher education. The "movement" towards performance-based teacher education (PBTE) had its roots in such new methods of teacher training as microteaching and Minicourses. Common to such methods were the specification and systematic fostering of desired behaviors. But PBTE subsumed under a larger umbrella this idea of mastering pre-specified behaviors. Demands that teachers be accountable for student learning created a need to assess teaching competencies in terms of student achievement. PBTE thus came to be defined as what the teacher must do; how well she or he performs; and how much students learn (Gage & Winne, 1975).

Almost as soon as the concept became recognized as a force in the field, PBTE was nurtured by a constituency in local and federal government, the teacher-education community, the educational research community, and the general citizenry. The concept was appealing despite an inadequate empirical basis (cf. Burdin and Lanzilotti, 1969).

Model elementary teacher-education programs. In 1968 the U. S. Office of Education sponsored a series of programs designed to incorporate the concept of PBTE and provide vehicles for research. These were nine model elementary teacher-education programs. Each was keyed to behavioral objectives and based on a systems approach. Each also included variations on the new types of training materials, already discussed, provisions for individualized instruction, and commitments (in varying degrees) to innovation and research (cf. Joyce, 1970; Shaftel, 1969; Burdin and Lanzilotti, 1969).

Table 1 shows how the model elementary teacher-education programs compared with four other kinds of teacher-education programs to be described below. The comparison is made in terms of the eight "elements" listed in the left-hand column. These elements were chosen initially because they were common to the Model Elementary Teacher-Education Programs, but they will be used below in describing other programs as well. In its first column, Table 1 lists elements common to the nine Model Elementary Teacher Education Programs. Some models obviously emphasize the elements to a greater or lesser degree than others.

Thus, one model, the "Competency-Based Field-Centered, Systems Approach to Elementary Teacher Education," developed at the Northwest

TABLE 1

Major Elements of Proposed Teacher Education Programs

Element	Programs				
	Elementary Education Models	Training Complexes	Teacher Centers	Perceptual Approach	STTM
Systems Analysis and Computer Technology	Ⓧ	X			X
Individualized Instruction (Direct involvement and self-directed learning)	X	X	X	Ⓧ	Ⓧ
Behavioral Objectives (Performance- or competency-based goals)	Ⓧ	X	Ⓧ		x
Non-Course, Lab Format (Instructional materials)	X	X	X	Ⓧ	Ⓧ
Faculty-Clinical Interaction as models; Supervision (Means of sharing decision-making)	X	Ⓧ	Ⓧ	X	X
Field-Based Experience/ Coalitions, Consortiums	Ⓧ	Ⓧ	Ⓧ	x	X
Adaptation/Innovation Emphasis	X	Ⓧ	X	X	Ⓧ

Ⓧ: The program contained an especially thorough treatment of this element.
X : A defined section of the program was devoted to this element.
x : The program documentation refers to this element, but no provision was made for implementing this element.

Regional Educational Laboratory is weighted heavily towards assessing teacher competencies in terms of student achievement (the "output" level; Schalock, 1969). The eight other model elementary teacher education programs stress the process of teaching (i.e., the "skill" or "knowledge" levels), rather than the product. In another case, the Florida and Michigan State Models incorporate extensive plans for engendering cooperation among diverse agencies (e.g., universities, schools, communities, professional teacher organizations), while the Georgia State University and University of Toledo Models merely skim the surface of this potentially powerful idea (Burdin and Lanzilotti, 1969).

Following the publication of the final report describing the models, several critiques and comments appeared in the literature (Joyce, 1970; Shaftel, 1969; Peck and Tucker, 1973). The critiques highlighted the strong and weak features of the models and offered valuable suggestions for putting them into effect (cf. also Rosner, 1972). A summary of the models' strengths and cautionary observations on some of the strengths based on the above sources, is presented below:

- The systems approach, in addition to increasing efficiency, has been shown through research to improve the teacher's effectiveness in both the cognitive and the affective domains (Peck and Tucker, 1973, p. 943). But systems analysis cannot substitute for a "philosophical framework of value commitments" (Shaftel, 1969, p. 23). For example, as Shaftel pointed out, the self-validating nature of a systems approach maximizes the ability to implement existing policy. But because the systems approach is so efficient, it may be less adaptable to social change. Like the computer programmed for maximum efficiency, the system may malfunction if fed data that "does not compute."

- When trainers of teachers (usually university faculty) model the behavior they expect of trainees (teacher candidates), social learning occurs, and the behavior is better taught.

- Direct involvement of trainees in their program of teacher education fosters professional commitment and personal development at an early stage in their training.

- Self-directed learning individualizes instruction and provides a welcome alternative to the frequently rigid and sterile environment of the university classroom. But while the individualized approach is valuable, many of the models need to expand their conceptions to include human relations training and "value criticism and reconstruction" (Shaftel, 1969).

- Use of behavioral objectives to focus on observable teaching patterns clarifies the process of teaching and establishes attainable performance criteria. But the use of behavioral objectives requires adequate coverage of unstructured as well as structured subject matter and expressive as well as cognitive performance criteria. By uncritically accepting behavioral objectives, some of the models risk losing sight of the "multidimensional nature of learning" (Shaftel, 1969).

- The attempt to build coalitions among diverse groups engenders an atmosphere of cooperation and shared decision-making that can respond to societal and academic demands. But coalitions between groups, as proposed by several of the models, need further examination. The models need to deal realistically with the differences in the groups involved. Habitual patterns of the traditional systems, where universities train and schools employ, need to be broken down. The communities' needs must also be met; newly certified teachers need to be able to cope with the lack of flexibility encountered in traditional schools.

- The functioning of the teacher as a clinician--working with an interdisciplinary team testing hypotheses and gathering data--increases the opportunity for teachers to contribute to research in education.

- The dynamic approach, which maintains the flexibility to change, is always to be chosen over a rigid structure or lockstep approach.

- Notable in several of the models is an implicit lack of attention to children (Shaftel, 1969)--their developmental needs and rights as persons. Many of the models, for example, strongly recommend team teaching. Pupils of differing abilities may not, however, benefit from the same approach.

- While most of the models are alleged to have a strong research orientation, they are often more prescriptive than experimental. They preach flexibility and prescribe exhaustive series of competencies, optimal organizations of the school, and traditional subject matters. Alternatives need to be examined.

Formal implementation of the models was never given financial support from the Office of Education. Internal changes in the structure of the Office altered the course of the original programs. Despite this setback the design and development of the nine models contributed greatly to reform in teacher education. Key ideas initially conceptualized in the models, such as "portal schools," "teaching centers," and "clinical school networks," were carried out by other programs like the Teacher Corps and various school districts. These ideas were modified to suit differential needs, applied to real world situations, and found beneficial (cf., for example, Corwin, 1973).

Training complexes. One form of coalition developed in the 1960s was the training complex proposed by B. O. Smith (1969)--"a new social mechanism with easy access to the schools and the universities" (p. 95). According to Smith, the concept was to be a center of training for other personnel in the "helping professions" (e.g., social workers, counselors, and recreation supervisors) as well as teachers. Trainees in the complex would benefit from research-based protocol and training materials; from workshops, courses, and laboratory sessions; and from actual practice with real students and clients. The staff of the complex would be recruited from the schools as well as the universities to provide a more varied range of experience. But the complex would always be committed to training functions and needs. Research, publication, and other scholarly activities would be confined to institutions established specifically for those purposes.

The program of training within a training complex would occur during an interval between a student's finishing his university preparation and his beginning inservice training. The student would spend six months to a year in training complex, enter the school system as an intern, and become a fully accredited teacher after one full year. The training complex concept thus assumed that the candidate's undergraduate or university-based education would primarily be theoretical, providing a firm grounding in the arts and sciences, and some subject matter specialization. The practice or intern function would be delegated to the staff of the training complex, where the teacher candidate would receive in a clinical setting "professional training on a saturation basis that neither college teacher preparation nor school inservice reeducation can offer" (Cohen, 1972, p. 38).

At the center of Smith's conception was an application of economic "critical mass" theory, where . . .

> the problem of changing instructional and administrative practices that go on within a school system is one of determining and producing the critical mass of personnel that will initiate the wave of change throughout the system itself (p. 108).

As forceful as Smith's arguments were, the training complex idea was afflicted with problems that caused it to fail in favor of a more immediately workable approach--the teacher-education center (described later in this section). The major problems of the training complex were monetary (establishing a network of training complexes would be very expensive), attitudinal (some members of the profession reacted negatively to such a radical reform as removing the training function entirely from the university), and functional (adding yet another stage in the teacher candidate's sequence of preservice development was infeasible for many institutions and was deemed unnecessary by others). In addition, the original conception of opening the complex to many areas of personnel training (in addition to teachers) was not well received by pre- and inservice teachers who felt the need for an organization devoted exclusively to teaching and its unique problems. So, while the initial idea required some modifications, the interest in promoting cooperation among the various elements contributing to teacher education persisted--indeed broadened.

Problems and Promises of PBTE

With the wide acceptance of many ideas in the Model Elementary Teacher-Education Programs and the interest in the potential of training coalitions, it seemed PBTE was here to stay. The main problem, however, persisted. PBTE lacked an adequate empirical base for many of its ideas and claims. It even lacked an agreed-upon definition (Rosner and Kay, 1974). Yet the next few years were to see an outpouring of PBTE literature perhaps unparalled in the history of teacher education.

The extent of this outpouring was manifested in "The Last Relatively Complete Tentative Bibliography on Competency Based Education" (Schmieder, 1974). This compilation showed that interest in PBTE has grown consistently stronger from its beginnings in the behavioral objectives movement of the late 1950s until the present, attracting a wider audience each year. A small indication of the effort can be seen in the work in 1971 of a "PBTE committee" of the American Association of Colleges for Teacher Education, which published and disseminated widely a series of papers to clarify the concept and discuss pertinent issues.

Also in 1971, the Bureau of Educational Personnel Development of the Office of Education designated a number of competency-based "program thrusts" that were analyzed at length by a federally-appointed task force (Rosner, 1972). In 1971 the Office of Education established the Multi-State Consortium on PBTE, which has since documented major efforts to expand the research base of PBTE, and held several regional and national conferences to discuss PBTE issues. In 1972 and 1974, respectively, whole issues of Educational Technology (November) and the Phi Delta Kappan (January) were devoted to PBTE. And, in 1975, the National Society for the Study of Education published a yearbook, Teacher Education, that included a chapter on PBTE (Gage & Winne, 1975).

While there can be no doubting the enthusiasm generated by PBTE, it had some overzealous supporters. (For an account of one misadventure, see Sandoz, 1974.) PBTE also still has conceptual and methodological difficulties (Gage & Winne, 1975).

Perhaps the most serious need of PBTE is a stronger research base, along with a continuing need for evaluation. Realistically, the idea has a long way to go before it can be put into effect with assurance as to its validity. The problem of how teaching competencies can best be measured is as great as that of determining which behaviors constitute competency. For even if we knew what skills, strategies, and styles make for excellent teaching, we are a long way from knowing (a) how to recognize and measure them, and (b) how to train for them (cf. Houston, 1974, Part 4). What's more, it may certainly be argued that many characteristics of good teaching cannot be "trained" at all. And if we were to find answers to these basic methodological difficulties today, there are still ethical considerations inherent in a model that may tend to impose one set of standards on all who practice in the field. Despite all of the good arguments for the "professionalization" of teacher education, which most often draw comparisons with such established professions as medicine and law, the fact remains that all of us have probably at some time in our lives had a "good" teacher who, for one reason or another, would never have met the kinds of stringent criteria of effectiveness given support today.

We tend to believe that in time the conceptual and methodological difficulties of PBTE will be overcome. The evaluation data have already begun to appear. Use of PBTE by the Teacher Corps has shown improvement in intern development (Steffenson, 1974). "It's working" in West Virginia (Maddox, 1972); at Weber State (Burke, 1972); in Syracuse (Jamesville-Dewitt--Syracuse University, 1974); in Oregon (Schalock, 1969); and in Texas, although with somewhat more difficulty, since PBTE was mandated by the State in 1972 (Houston and Howsam, 1974).

As indicated in Figure 6, some form of PBTE has been the overriding concept in teacher education during the last decade. Whether PBTE will continue to dominate the field will depend, of course, on the adequacy of its empirical support, as well as its continuing acceptance by teachers, professional teacher organizations, communities, and universities alike. It will also depend (as we have tried to show) on social developments yet to come.

PBTE has not gone without its skeptics, or its critics. The preceding pages have outlined responses of teacher education to the social changes of the 1960s. The next section will discuss some reactions to the changes taking place in teacher education. It will discuss the emotional, rather than the practical side of teacher education. In doing so, the section that follows will attempt to show also that both response and reaction are needed if all parties are to accede to and benefit from change.

Humanistic Reactions to PBTE

> The humanistic quest is to encourage the development of teachers who are both creative themselves and capable of enhancing the creative energies of their students (Nash, 1973, p. 7).

Perhaps the most outspoken opponents of PBTE are those who may be termed, with much ambiguity, "the humanists." Following Broudy's (1973) criticism that formal PBTE programs "de-professionalize" trainees by permitting them to master competencies without theory, several others criticized PBTE for its "mechanistic" treatment of a human situation (Jackson, 1968). Among these, the writing of Combs (1965) is representative.

While Combs' original ideas for improving teacher education were published in 1965 (before the growth of the PBTE movement), he has also reacted more recently (Combs, 1972; Combs and Kinzer, 1974). Joyce (1974) has summarized Combs' "perceptual view" of teacher education. In this work, Joyce pointed out that the unified, Gestaltist approach of Combs and other "personalistic" educators is not necessarily antithetical to systematic behavioral analysis and training. In fact, earlier work by Joyce and his colleagues in the teacher-education program at Teachers College, Columbia University, provided some initial empirical support for such a proposition (cf. Joyce, Weil, and Wald, 1973). The more recent writing of Combs, however, seems to imply a softening of his original position. For example, Combs (1965) wrote that

> To use particular competencies as a measure of good teaching irrespective of personalities, situations, or purposes leads us to the ridiculous conclusion that some of the people who taught us more were poor teachers. When I hear young teachers-in-training remark, "Oh, he is a lousy teacher but you sure learn a lot," I am forced to conclude that the determination of the goodness of teaching on the basis of competencies is highly questionable (p. 6).

In contrast, Combs and Kinzer (1974) wrote that

> The University of Florida's Childhood Education Department and numbers of other departments with whom we work have had frequent heated dialogs about our professional responsibility to be accountable. We are now confronting the accompanying need to make explicit our goals, competencies, and means of assessment. These important considerations have not been totally resolved. Our program is concerned with a "people-oriented" rather than a "thing-oriented" product, and therein lies our dilemma (p. 187-188).

Quoting Combs in this way may misrepresent his real intention in the 1974 work. Combs' overall purpose was unmistakably to indicate that he intended to oppose any PBTE approach. The fact that he recognizes a "dilemma" is a small, but significant piece of evidence that contributes to the attractiveness of what appears to us to be a balanced alternative view.

This view has been expressed by Joyce (1974), Gage and White (1975), Heffernan-Cabrera (1974), Nash (1973), and others. All of these writers acknowledged the potential of a balanced view. The view may be seen as a special case of "behavioral humanism," which Thoresen (1973) defined as

"the synthesizing of social learning-behavioral principles and techniques with the goals and concerns of humanistic psychology" (p. 385). It is the idea that a marriage of the competency orientation (with its operationally defined objectives for teacher education) and the humanistic view (with its stress on the importance of personal self-actualization) (Maslow, 1954) would benefit teacher education in two important ways. Such a union would anchor teacher education to a scientific base in which research and evaluation endeavors are not only possible but encouraged. It would also establish the field professionally, because, like the other "helping" professions, it will engender in its members a strong personal commitment--a "meaningful involvement" (Combs, 1965, p. 29) with children, with learning, and with the educational system.

Gage and Winne (1975) noted that the individualized instruction and practice of PBTE affords a wealth of opportunities for attaining humanistic goals. Once these goals are formulated in behavioral terms, they can be systematically attained through a program of individualized instruction and integrated into the teacher candidate's internal "belief system." One example might be the kind of behavioral specification done by Thoresen (1973): "Increase the frequency, variety, and accuracy of internal self-observation responses (self-knowledge; knows what is going on within; is really aware of self)" (p. 413). But this kind of reformulation of goals, as Nash (1973, p. 3) [illegible]cedes, is no small task.

Humanistic formulations are necessarily abs[illegible]t. Humanistic goals typically describe internal states that do not readily lend themselves to operational specification or quantification. In the humanistic view of Carl Rogers, for example, the teacher is merely a mirror that the student can use to reflect on himself and his own purpose in life (Rogers, 1969). One can only imagine the broad and abstruse goals that might result from such a complex theoretical principle. One of those suggested by Elam (1971), is example enough: ". . . developing in the student the self-confidence to remain immersed in the learning experience long enough and deeply enough to make the assimilation of the experience personally relevant" (p. 19).

But while humanistic goal specification is a problem, attempts to simplify abstract theories and concepts for instructional purposes have already been undertaken, with some success (Joyce and Weil, 1972; SWRL Educational Research and Development, 1974). Furthermore, Nash (1973) warned against over-dependence on objective quantification of subjective states: "It is true that objectivity and precision are virtues under certain circumstances, but it is important to understand what those circumstances are" (p. 10). The nature of the task as in, for instance, "creative invention," may not require precision of measurement, and may better be evaluated from a subjective and qualitative point of view.

Obviously, a marriage of PBTE and Humanistic Education requires a deeper examination of their concepts and how they may best function to benefit one another. Nash (1973) provided a beginning for this kind of searching analysis. Additionally, Joyce (1975) has tied this process to the various "conceptions of man" inherent in prevailing views of teacher education. As Joyce saw them, the conceptions of the Progressivists (Dewey, James), the Academicians (Bruner, Goodlad, Ausubel), the Personalists (Combs, Rogers, Maslow), and the Competency Orientation (Popham, McDonald, Schalock) may be competitive but not incompatible (p. 141). In fact, Joyce proposed, there is a "power in alternative views," a power that can draw together competing philosophies to create a sturdy foundation for growth (p. 144). In Joyce's view,

> It should be possible to build a synthesis that succeeds, without sinking to an absurd eclecticism, in developing views of education and of the education of the teacher that can capitalize on the real truths that lie embedded in competing philosophies. The alternatives are sufficiently clear and well developed to enable . . . teacher educators to make such a synthesis if they can develop the appropriate forum for dialogue (p. 145).

Heffernan-Cabrera (1974) considered the problem of evaluating teaching competency to be a major stumbling block in any merger between the humanist and competency-based camps. She also noted that "a program dealing with holistic development of a teacher must concern itself with qualitative evidence" (as well as quantitative). And a program of teacher education designed to promote "self-determination" on the part

of the teacher candidate must include an element of "self-diagnosis" or self-evaluation (p. 49).

To the first of Heffernan-Cabrera's points, Eisner (1975) has recently devised an approach to qualitative teacher evaluation--one that he terms "educational connoisseurship and criticism," after the fashion of literary, art, or film criticism. Eisner likens his model to the judgment of a wine connoisseur who analyzes the properties of wine, judging the background characteristics of the wine, the way it was handled, its brilliance and clarity when poured, and its taste. Teachers can similarly be evaluated on their overall quality: their background and experience, their classroom behavior, the effects they have on their students. And, to stretch the analogy, we might add that the astute wine connoisseur is well aware of the care taken to create a quality wine--enough to recognize that even a wine of the finest breed may, on examination, prove disappointing, just as a wine without credentials, through proper handling, may exhibit its own sort of finesse. Almost always, in addition, a good wine will stimulate and capture the imagination. As credentials and proper handling both contribute to the quality of splendid wine, so do education and experience contribute to the quality of a good and stimulating teacher.

The picture that the educational critic paints of the teacher is a subjective, non-quantified "judgment" based on and inextricable from the critic's own experience and values (p. 7). But, as a criticism of other art forms, the critics or reviewers must be experts who have toiled in the vineyards of their subject matter so that they know what qualities to look for--the qualities that make a work of art. In addition, they must be able to describe what they see in richly vivid, even metaphorical, terms. Examples of the kind of vibrant description Eisner has in mind might be the following:

> The way she taught was like a small drama--each child was a part of it; it was alive . . .

or;

> The classroom was gray; without color; drab. She spoke simply in a wall of words.

Teaching can be seen, then as a performing art, where the teacher is a skilled professional, and the teacher candidate is learning to "become" the same.

A humanist might argue that the purpose of the teaching profession is not to entertain or please, as is that of drama or art. Rather teaching is intended to render a public service, to educate children to know themselves and the world around them. Thus to judge teachers as one would judge actors or artists is to judge them in roles for which they are not, and should not, be trained. It is to evaluate them against inappropriate criteria. Teachers, more appropriately, should be evaluated in the same manner as other "helping" professionals--by their success with their clients: students.

Eisner does not, however, propose educational connoisseurship and criticism as a replacement for quantitative evaluation, or for evaluation based on subjective and objective criteria of success. Rather, he offers it as an alternative to be used with quantitative evaluation to supplement and enrich our conception of the teaching-learning situation. He offers it as a badly-needed "descriptive" measure (cf. Cronbach, 1975) to add depth and substance to our limited base of empirical knowledge about teaching. To this end, Eisner's concept has self-evident value.

The intuitive appeal of the idea (metaphorical language notwithstanding) is also self-evident, especially to researchers who have recently visited the schools, or who have been there and remember. The activities of the typical classroom are far too complex to be sufficiently quantified, for too much that might really make a difference is missed, simply by the necessarily exclusive nature of quantitative measurement. In looking at some things, quantitative measurement necessarily excludes others. The field research of today is finding this more and more to be true. Kounin's bizarre-sounding concept of "withitness" (eyes in the back of her head) exists, and has been shown to be related to effective teaching (Dunkin & Biddle, 1974, p. 149). Berliner and his associates (Tikunoff, Berliner, & Rist, 1975) used ethnographers in the classroom to identify just such unique and difficult to discern variables for further study. Eisner (1975, p. 5) refers, in addition, to other research using classroom ethnography.

We sense that indeed there is a little of the performer in most teachers, just as there is a little of the therapeutic "helper" in most actors and artists who offer the world an arousal and realization of their emotions. It would be unreasonable to say that either quantitative or qualitative evaluation alone does it all. But together they seem to be able to open new paths for our search for what goes on in the classroom and in teacher education.

Regarding the point that a humanistic teacher-education program should provide for self-evaluation, Washington (1971) compiled extensive data on the effectiveness of a measure she developed and tested in the late 1960s. Her measure consisted of a set of 25 "standards" by which teaching can be evaluated. Teachers and supervisors are taught techniques of observation and evaluation, which they use cooperatively to improve the quality of instruction. Self-evaluation is the key to the effectiveness of such a program. According to Washington,

> There are three important reasons why teachers must assume the responsibility for evaluating their own performances:
>
> 1. The quality of the classroom instruction depends on the expertness of the teacher. Any improvement in instruction requires a change in the behavior of the teacher.
> 2. Improving classroom instruction requires a comprehensive knowledge of the total teaching environment.
> 3. People exert themselves most effectively when they are attempting to achieve goals they have set for themselves (p. 33).

Washington's system stressed interaction and mutual respect on the part of teachers and supervisors attempting to improve teaching practices. The 25 standards are graded according to the teachers' experience, and teachers are judged only in relation to these standards, not against other teachers.

Washington's self-evaluation system is a good example of the value of this sort of personal scrutiny. But it is certainly not the only or the best-known system of its kind. Joyce (1975) described how the interaction analysis schemes of Flanders, Taba, Spaulding, and others operated on similar principles: The teacher "would learn to analyze specific

elements of his behavior, gain control over those elements," and then modify or expand his behavior accordingly (p. 138). These early self-evaluation schemes significantly influenced existing teacher-training programs, Joyce noted, in that they were the forerunners of the feedback features of the microteaching arrangements that eventually led to PBTE.

Recent Trends

In short, many teacher educators reacted to the new technology and behaviorism of the 1960s with an interest in humanizing the quality of the classroom. The major response of teacher educators was to modify and improve the field-centered component of teacher education, what traditionally was "student teaching." According to Burdin & Mathiesoln (1972), if the sparse research on PBTE showed anything, it was the value of working in the real world. The idea of extended internships in the schools had become the foundation for programs like the Teacher Corps and the nine Model Elementary Teacher-Education Programs. Hence, new and different ways of providing optimal real-world experiences for teacher candidates were both conceived and tested for their efficacy. Among the more promising field-centered components, training complexes, portal schools, and teacher centers are probably the most significant.

Portal Schools

In-depth plans were drawn up for the long-range, nation-wide implementation of training complexes (Cohen, 1972), but, as mentioned earlier, the idea proved impractical and was eventually encompassed by the teacher center approach, which will be described in detail below. Considerable enthusiasm grew up around the portal school idea as a result of its visible successes in impoverished areas supplied with Teacher Corps interns for extended periods of time. In the usual sense, a portal school works with a university, participating in local teacher-education programs and attempting to improve the achievement of pupils in the school. The name was so chosen because portal means "point of entry" --here, an entry for new ideas, different teaching methods, altered staffing and organization patterns, and new combinations of resources in the school, the community, and the university (Hilsinger and Schantz, 1973, p. 21). In this sense, the portal school strategy became a means of coordinating the efforts of highly interdependent but

often noncommunicating groups--a means of "bringing it all together." The idea was to "saturate" the school with instructional personnel in an all-out effort to improve both the teacher-education program and the achievement of students.

Early portal school projects were undertaken in disadvantaged areas where help was severely needed. The universities needed a place to test their competency-based teacher-education programs, to give prospective teachers important practical experience and knowledge of the workings of an actual school. The schools needed to improve their teaching methods, to update worn out methods, to learn the results of recent research--perhaps more important, to revitalize their teachers' personal commitments without placing teachers in lecture halls after a full day of teaching.

Here was a chance to improve traditional in-service education. Here in-service teachers could learn in their own school environments by interacting with interns and university supervisors familiar with new teaching techniques and interpersonal skills. The community needed better education for its children, increased parental involvement, more frequent feedback, even advice for education in the home. With coordinated effort, these things became possible. Interns could spend time with the community, parents could spend time in the classroom, university professors (so often divorced from the reality of the school setting) could observe the problems and devise ways to rectify them as never before.

No wonder a following grew up around this idea. At last teacher education was making real efforts to reform the system. According to the reports of early portal school projects, the saturation of the schools had its payoffs. Schools operating in conjunction with Teacher Corps and Temple University, for example, reported significant increases in average achievement scores for each of the two years of the project. In addition, teacher turnover in these schools was reduced, inservice education was conducted at no added cost, and parental involvement increased (Hilsinger & Schantz, 1973, p. 24). Other successful ventures in the portal school strategy included the Georgia portal schools (Shearron, 1973), the Buffalo, New York, project (Masla, et at., 1973), and the Pueblo, Colorado, community-based education project (Southern Colorado State College Teacher Corps Staff, 1973).

The portal school concept was one positive response of teacher education to the increased interest, in the 1970s, of parents, communities, and teachers in having a voice in the workings of the system. This decade also saw a growing emphasis on the value and expansion of human consciousness, because dwindling natural resources and wartime politics created a need for people to turn inside themselves for answers. Further, the struggle of minority groups to achieve social and economic quality was more generally recognized and supported.

To these significant social developments, education had to respond. In 1972, the Office of Education funded a series of independent National Field Task Forces on the Improvement and Reform of American Education. The Task Forces represented six substantial areas of interest: administration and supervision, basic studies, the community, the Council of Chief State School Officers, higher education, and teachers. Each of these was charged "to help improve the nation's school systems and the people who staff them" (Smith, 1974, p. iii). One overriding theme in these reports is the need to change the attitudes and practices of the educational system towards various minority groups. Specific recommendations aimed at this need were outlined in reports of the Task Forces on administration and supervision, teachers, the community, and the Council of Chief State School Officers. These Task Forces included representatives of various minority constituencies. In this sense, the statements and recommendations made can be considered to have emanated from actual and not just perceived needs. In another sense, they are indicative of an expanding, more "humane" consciousness. Examples of these recommendations include the following:

- Americans, by and large, possess little conception of how heavily public institutions, values, and actions press down upon non-whites and the poor . . . . From this relatively change-resistant and sometimes oppressive system, it is difficult to learn the arts of freeing men through education and liberating their spirits as well as their minds. Thus, there is a need to join the community in the struggles rather than resist the reform effort through professional channels alone (Community National Field Task Force, 1974, pp. 14-15).

- One very important way in which a school system can demonstrate its endorsement of multicultural dignity is in its staffing In recent years, urban school systems have begun to make opportunities available for leadership roles for members of various racial minority groups and women. The numbers and proportions do not yet approach equity. Clearly there is needed an affirmative action thrust to locate, recruit, train, and place in positions of school leadership more representatives of various minority groups . . . (Administration and Supervision National Field Task Force, 1974, pp. 29-30).

- Appropriate coalitions must be established to provide inschool experience so that the prospective teacher has experiences in a number of schools, . . . and a variety of school communities, inner-city, suburban, and rural. . . . It is unrealistic to support a general educational program that purports to train teachers and at the same time isolates them from the school environment where they will be expected to perform with competence (Teacher National Field Task Force, 1974, p. 10).

These and other Task Force recommendations unquestionably challenge the educational, political, and economic systems of America to take action to effect change. In their concentrated suggestions on where to begin, the six Task Forces agreed particularly on one thing. The Higher Education Task Force held that

> If one accepts (the) thesis--that social action is a product of individuals interrelating in groups--the degree to which education responds to social needs will depend largely on the extent to which individuals, working together cooperatively, are motivated toward a common good (p. 6, italics ours).

This principle of cooperation--partnership, coalition, and parity--was seen to be basic to the most popular and most recent response teacher education has made to social needs: the teacher center.

Teacher Centers

The idea of the teacher center was borrowed from Britain (Thornbury, 1974) and modified to suit the American interest in engendering cooperation among various groups concerned with education. Several forms of teacher centers have been established in U.S. schools since the late 1960s (Selden & Darland, 1972; Yarger and Leonard, 1974). Broadly defined (Schmieder and Yarger, 1974) the teacher center is:

> A place, in situ or in changing locations, which develops programs for the training and improvement of educational personnel (in-service teachers, preservice teachers, administrators, para-professionals, college teachers, etc.) in which the participating personnel have an opportunity to share successes, to utilize a wide range of education resources, and to receive training specifically related to their most pressing teaching problems (p. 6).

To clarify the diverse forms of the concept that have appeared in this country, Schmieder and Yarger also developed the following preliminary "typology of teaching centers":

The independent teacher center is unaffiliated with any established institution, typically involves teachers on a voluntary basis, and deals with individual teacher needs rather than complex institutional concerns. It also operates with greater freedom than other centers, but less financial security.

The "almost" independent teacher center is linked with an educational institution, but because of the influence of its personnel, operates with a high degree of autonomy. Like the independent center, its teachers participate voluntarily, and its main concern is with their unique needs and interests. Some institutional pressure is evident.

The professional organization teacher center is rare among American centers. Both the "negotiated" teacher association center (which emerges from bargaining with a school system) and the "subject area" center (which deals with concerns of particular subject-area specialists, such as art) deal primarily with the needs of related professional organizations. The former type tends to focus on professional and educational problems, while the latter usually emphasizes the subject matter of interest.

The single unit teacher center is associated with a single educational institution. Often similar to the traditional inservice program, but with greater organization and more explicit goals, this most common type of American center uses institutional resources and funds.

The free partnership teacher center usually involves a school system and an educational institution, but may involve two of either, or a non-educational agency. Always consisting of two agencies, however, the

"free" partnership is entered into willingly, and is therefore easier to initiate and maintain. It often evolves from a successful single unit center.

The free consortium teacher center is formed by three or more institutions that willingly enter into a center-supporting relationship. Policy and financial matters become complex and are often resolved by more general goal setting and outside sources of support. This kind of center has great long-range value potential, once the participants have learned to work together.

The legislative or political consortium teacher center is one prescribed either by legislative mandate or political influence. This kind of center is a "forced" consortium. Financial incentives may be used to attract participation. It often uses complex communication systems to assist program development. It may range in size from a sub-county to a total state organization. It may be used in some areas to recommend candidates for professional teaching certificates.

In characterizing their typology, Schmieder and Yarger say that "if there is any one feature that characterizes American teaching centers, it is their diversity" (p. 6). But this very diversity indicates the extent to which the concept has spread. Much attention has been given teacher centers in educational literature (cf. ERIC subject entry, "Teacher Centers," 1974 Annual Index) and conferences (e.g., the Multi-State Consortium on PBTE held a regional conference on Teacher Education Centers at Florida State University in March 1974). A National Teaching Center Survey (Yarger & Leonard, 1974) has been conducted to investigate "the nature and extent of teacher center-type operations and the place of teacher centering in the provision of inservice training" (p. 13). This survey had a fairly low rate of return from the 1,700 institutions approached (24% return from 1,119 school districts, 39% from 571 colleges and universities, and 50% from a select sample of established teacher centers). Nonetheless, the data from the 600 sites that did respond to the questionnaire yielded interesting information.

1. Of the 600 responding sites, sizeable proportions exist in both rural and urban areas (e.g., 80% of the school systems were

located in towns with less than 50,000 people; over half of the colleges and universities described themselves as either urban or suburban) (Yarger, 1975, p. 4).

2. Many sites exhibited "a high degree of collaboration between and among institutions, agencies, and role groups." Of all groups sampled, 41% to 63% described their policy-making board as including administrators, teachers, and either students, student-teachers, or community members (pp. 4-5). A survey of the 50 state legislatures (E. D. Smith, 1974) indicated this same emphasis on cooperation and parity in the policy-making bodies.
3. All groups surveyed most frequently directed their efforts toward improving classroom instruction. Little emphasis was placed on social gatherings. This finding distinguishes American teacher centers from European centers, which have a notable social component (cf. Thornbury, 1974). In addition, interest in the development of teaching skills and strategies outranked interest in developing new curricula and other instructional materials. Individualizing instruction, classroom management, and humanizing education all received high priority in the 600 teacher center sites (Yarger, 1975, p. 5).
4. Program evaluation was given highest priority by the school district sample (school districts ranked program evaluation in the top three of the activities carried on by center staff). In the two other groups sampled (colleges and universities, and teacher centers), teaching, consulting, and product development were given highest priority (Schmieder & Yarger, p. 11).
5. While financial data obtained by the survey proved inadequate, Schmieder and Yarger state that generally speaking, teacher centers are being given a very small amount of monetary support from educational funds (usually less than one percent of total institutional budgets (Yarger, 1975, p. 6)).

These generalizations and the finding of the survey by Smith (1974) indicate that 18 of the 50 states have given some sort of support to the

establishment of teacher centers. It seems evident that the concept has rapidly become a major force in teacher education. It seems to have the potential to respond positively to some of the social needs of this decade. Centers already in existence are opting for collaboration toward reform and for the individualization and humanization of classroom instruction.

Some caveats, however, are in order. While teacher centers, like PBTE, are popular and potentially important vehicles for improving teacher education, evaluative data on teacher centers is scant. More established centers, like those in Syracuse and West Virginia, have compiled questionnaire and rating scale data. But West Virginia's MITEC (Multi-Institutional Teacher Education Center), for example, has been in existence since 1966, is now operating independently of external funds, and encompasses seven state colleges and universities, four out-of-state associate institutions, and two county school districts. Should such a wide-scale effort have presented more than process data to support its claims of effectiveness? Should it have presented data relating student achievement to teacher center activities? As a result of a recent call for research proposals from MITEC's research and evaluation department, one research study of this sort has been conducted (Corno and Stayrook, in progress) Other teacher center operations, like that at Florida State University, have begun to make efforts to examine the evaluation problem (cf. Florida State University, 1975). Only when such research is undertaken will the full value of teacher centers be known.

The Syracuse Survey indicated that most teacher-center policy boards included representatives of various populations involved in teacher education. But the largest percentage of board members were administrators (Schmieder & Yarger, 1974, p. 10). While administrators do function to organize and coordinate instructional efforts, the concept (and perhaps the life) of a teacher center focuses on the needs of teachers. Indeed, this focus is part of the reason why teacher centers have proved to be more workable than training complexes. Teachers want to update their instructional techniques. They want the benefit of research results.

They want to increase pupil learning. They want to be professionals. What teachers do not always want is to be told what their needs are, and how these needs will be met. In this view, as practicing professionals, teachers deserve more than equal representation on policy boards--something more than just a "say." Increasing teachers' degree of control will undoubtedly affect their willingness to continue inservice education and maintain a "commitment" to the profession.

Finally, with Schmieder and Yarger (1974) and the Teacher National Field Task Force (1974), we stress the need for financial support of teacher centers. A larger share of institutional budgets should probably be spent on such a promising movement in teacher education. Funds should be allocated by Federal and State governments on the condition that process and product outcomes will be evaluated. Ideas that have proven effective in other countries and taken such a firm hold in the U.S. merit such encouragement.

This section has discussed the evolution of teacher education from the late 1950s to the present. To complete the discussion with a description of the American teacher-center movement is appropriate because it reflects the present state of the field and lays the foundation for the design for teacher training proposed herein.

Summary and Conclusions

We close by summarizing the major principles on which a contemporary program of teacher training should be based. These ideas originate or are implicit in the literature reviewed in the foregoing pages. They represent the goals of an evolutionary design for teaching training.

Technological Advances

More efficient and more effective technology has contributed greatly to improving the process of teacher training. On this, almost all major writers agree (see Bishop, 1976; Nicholson, Joyce, Parker, and Waterman, 1976; and Rubin, 1976). More systematic and better tested materials for training teachers are now available. These materials can now be assessed by topic from several catalogued collections of materials--or "automats"

(e.g., Stanford Program on Teaching Effectiveness, 1974). More and more, teacher-training sites have videotaping and computer-assisted instruction equipment available for use by preservice and in-service trainees.

Devices such as these should form an important part of a modern teacher-training model. They should be available in abundance for use by trainers and trainees, working individually or in groups. A system for gaining access to the materials and devices, designed along the lines of those developed for the various catalogues of available materials, should be provided at each training site. If possible, training-site personnel should review the quality of presentation, content, method, and goals of all materials described in the catalogue. A teacher can then go to the catalogue with her topic, scan the various training materials available, and choose those that best suit her needs. If only materials of fairly low quality are available for any one topic, the teacher may choose to alter the material, adding her own ideas or ideas from other sources, and try out the modified material with a number of teacher trainees. In this way, teacher trainers and teachers themselves can contribute to ongoing research on teaching. Thus increased efficiency, greater effectiveness in relation to cost, the development of alternative materials, and the availability of greater numbers of research materials are among the benefits to be gained from a program having training materials and devices as its core.

Social-Psychological Developments

Throughout the history of education, advances of all sorts have been tied to the socio-political mainstream (see Sands & Gross, 1967). The present situation is no different. We have documented the strong interest of various constituencies--politicians, behavioral scientists, professional associations, and local community members--in the quality of instruction being offered in schools. Efforts to coordinate such diverse groups have led to the development of such organizations as training complexes, portal schools, and teacher centers. In these organizations, parents and community members, teacher educators, and school district personnel can work together toward improved education. What is more, they can do so in

an atmosphere of participative planning and genuinely humane concern rather than authoritarian directiveness.

It goes without saying that collaborative effort requires systematic planning and preparation. Such an effort can be highly effective given a rich resource pool of university personnel available to coordinate and monitor the effort (cf. Corno, 1976). Too frequently such an effort is made without critical analysis and systematic planning. Such projects then yield little return or--worse--never get under under way. Thorough analysis should be undertaken at the outset. Then important issues, the relative merits and drawbacks of alternatives, political constraints and pressures, and the results of pertinent research can be taken into account. In each case, the purpose, function, program, organization, financing, and governing system of the teacher-training organization should be specified in advance. Only then will the promise of teacher centers be realized--the promise of bringing the abundant resources of the entire educational community to bear on the needs of teachers and students.

Chapter III. THEORY AND METHOD IN RESEARCH ON TEACHING

Over the past decade research on teaching has produced a sizeable body of findings. Of these findings, many suffer from problems inherent in the youthful state of the art. Like research in the behavioral sciences, research on teaching has had to move piecemeal into its own. And like the behavioral sciences, research on teaching faces difficulties in establishing lawful relations that are perhaps less severe for the natural sciences.

Complex Interactions

If we know anything lawful about human behavior it is that people differ. What may hold for one person under certain conditions may not hold for another under the same conditions. Further, what will hold for one person under these conditions will rarely hold if conditions change. And in the classroom, conditions inevitably change rapidly. Thus the processes of teaching and learning are exceedingly complex processes of interaction between the person (teacher or learner) and the environment (Lewin, 1951). The existence of these complex interactions permits few general principles of human learning in schools to hold in the simple forms in which they might be established under controlled laboratory conditions. While psychological learning principles will hold in the laboratory, educators must cope with an environment over which relatively little control can be exercised.

Most research on teaching has been based on relatively simple models that did not take adequate account of the complexities of the phenomena under study. Many of its findings therefore lend themselves to misinterpretation, oversimplification of psychological constructs, or overgeneralization from inadequate samples to populations of interest. That educational researchers recognize the special problems connected with their endeavors is evidenced by a burgeoning literature of methodological handbooks and critiques (cf., for example, Snow, 1974; Cronbach and Snow, in press; Campbell, 1973). While the field stands to overcome research difficulties as it grows in sophistication, a solid political element

inexorably tied to education is pressing for a scientific revolution in the sense developed by Kuhn (1964).

A political element embraces education because education shapes the youth of society, and as long as there is social strife, education will receive much of the blame. Educators have, then, a double allegiance: one to the knowledge we pursue through research and one to the duties we carry out in practice. Cronbach voiced this dilemma in 1966:

> The educational psychologist is torn between two responsibilities. His responsibility as educational specialist is to give schools advice on matters where the evidence is pitifully limited. His responsibility as scientist is to insist on careful substantiation of claims for each educational innovation. In education, unfortunately, there is great furor about whatever is announced as the latest trend, and the schools seem to careen erratically after each Pied Piper in turn. This giddy chase keeps them almost beyond earshot of the researcher standing on his tiny, laboriously tamped patch of solid ground, crying in a pathetic voice, "Wait for me! Wait for me!" (p. 91).

The resolution of the dilemma is to fulfill both responsibilities in good spirit, deliberately and judiciously.

Centers and Laboratories

During the 1960s, federal offices concerned with educational policy increasingly embraced the model of systems analysis for developing and evaluating social programs. "Programmatic" research and development became an attractive means of reforming schools. The idea was to establish institutions--laboratories and centers--which would contract with the federal government to carry out specific programs of research and development. Needed research-based reforms could thus be designed and put into effect in schools within a relatively short time, such as 3-5 years.

The laboratories were charged with development of educational products, such as new curricula based on certain psychological learning principles. The centers were to conduct basic and applied research to lay the basis for development, perform the development, and assess the effects of various educational practices. Educational research and development included such activities as evaluating new methods of

curriculum construction, testing hypotheses about teaching and learning, examining scheduling alternatives, and devising products for use in teaching and learning. The laboratories and centers were thus to contribute to the search for a scientific basis in teaching and teacher education, as well as other educational functions.

Early expectations for the laboratories and centers were not fully met. To name but a few of the difficulties that arose, time lines were too short, qualified personnel were rare, and conceptions of the research and development process in education were naive. In 1970, and again in 1972, cutbacks in federal funding were inflicted on many of the laboratories and centers. Some laboratories and centers were appropriated no additional funds and thus forced to fend for themselves or disband. Others whose funds were continued--at least in part--reexamined their programs, and many changed direction to survive.

Among the survivors, a topic of continuing interest was the study of teaching. Gradually realizing that teachers control to great extent what transpires in the classroom, more and more of the centers and laboratories focused on the study of teaching and the teaching-learning process as one logical way to approach educational reform. The general nature of past and present research on teaching--what it is and where it is today, as well as substantive issues that pervade the field--is worth examining. This examination should be oriented toward the basic purpose of improving the scientific basis for teacher education.

Some Methodological Issues in Research on Teaching

Research on teaching includes research on teacher education and research on teacher effects: "the study of relationships between variables, at least one of which refers to a characteristic or behavior of a teacher" (Gage, 1972, p. 16). A study designed to evaluate the effectiveness of a program of inservice education would be research on teacher education. A study relating the construct of teacher "warmth" to student achievement would be research on teacher effects. In the former study, a certain dimension of teacher behavior would be a dependent variable in relation to the program of inservice teacher education. In the latter study, the

teacher quality of warmth might be an independent variable in relation to pupil attitude toward school.

Research on teacher education and teacher effects has been conducted for half a century. Several major works exist as summaries, including two handbooks (Gage, ed., 1963; Travers, ed., 1973) and two review volumes (Rosenshine, 1971; Dunkin & Biddle, 1974).

The Methods of Research on Teaching

Most research on teaching has been correlational, or non-experimental. Unlike experimental research, which manipulates variables, correlational studies measure characteristics and events as they exist. In correlational study, the investigator determines the degree to which variables "go together"--are associated with one another--in a statistical sense. A correlation tells the degree to which one variable tends to change as another variable changes.

Such correlational research has a logical place in research on teaching. One determines the degree to which teachers exhibit certain kinds of behaviors or characteristics, and also measures some criterion of effectiveness, such as how much the students like the teacher, or how much they learn. The correlation between the teacher behavior or characteristic and the criterion of effectiveness gives us a clue as to the desirability of that teacher behavior or characteristic. The chief value of correlational research is that it deals with the real world, with things as they are, uncontaminated and unchanged by any manipulation or treatment interjected by the investigator. Furthermore, corrrelational studies yield hypotheses about what teacher behavior or characteristics cause better or worse student achievement. True experiments are necessary to ensure that one variable causes another to change. The choice of variables to be manipulated in experiments is usually improved by prior knowledge of the results of correlational studies.

Thus correlational research has a valid place in scientific endeavor. The chief difficulty is that correlational techniques do not permit interpretations of causality. Descriptions of correlational results must use other verbs of association (relate to, vary with, etc., rather than "cause," "determine," or "influence"). Experimental research, on the other hand, illuminates cause-and-effect relationships. It has

been hailed by Campbell and Stanley (1963)...

> ...as the only means for settling disputes regarding educational practice, as the only way of verifying educational improvements, as the only way of establishing a cumulative tradition in which improvement can be introduced without the danger of faddish discard of old wisdom in favor of inferior novelties (p. 172).

The treatise by Campbell and Stanley (1963) on "Experimental and Quasi-Experimental Designs for Research on Teaching" raised considerably the general level of understanding of the advantages and problems of experimentation. Many writers (e.g., Rosenshine, 1971; Dunkin & Biddle, 1974; Kerlinger, 1973) have since emphasized the need for more experimental research on teaching. In recent years, more experimental studies have been conducted. But for reasons only recently illuminated, the methodology of many of these experiments has been unsound (cf., Berquist and Graham, 1975; Cronbach & Snow, in press).

Experimental design is a precision operation in a laboratory setting. Psychological research on learning and laboratory studies of teaching, such as microteaching, have typically been conducted in compact, tightly controlled situations that can minimize extraneous interference and unanticipated events. Random assignment of subjects to treatments is relatively easy; methods of observation and measurement are painless.

But any one familiar with American schools knows that creating these conditions in the field is impossible. The school operates in a complex of constraints, over which the experimenter has little control. He can rarely randomize student assignments to teachers. He can rarely count on completely uniform curricula from class to class even within the same subject matter and grade level. He can only with difficulty assign teachers to different treatments at random. He cannot count on freedom from new arrangements, such as team teaching and multi-graded classes, that make it more difficult to trace unequivocally the effects of specified teaching methods and teachers. He can "manipulate" teaching methods only after delicate and complex teacher-education programs have been installed. He must work only with teachers who volunteer; teachers cannot be required to participate in research.

For these reasons, many investigators have been reluctant to take

on the task of field experimentation. Those who have braved the threats were often overwhelmed with the magnitude of the task. Of necessity they have often compromised one or more components of the research design. Since design modifications result in loss of internal or external validity, the experiments became only "quasi-experimental". (Internal validity refers to the degree of warranted assurance that X is causing Y, while external validity refers to the "generalizability" of findings to situations or persons beyond those on which the investigation was performed [Cook & Campbell, 1976].) Other research was conducted without adequate knowledge of experimental technique and accompanying statistical analysis. Overstated claims or misinterpreted statistics, or both, have sometimes undermined the validity of research on teaching. Research results are sometimes used for ethically questionable ends.

Nonetheless, the field of research on teaching has become considerably more sophisticated in recent years. Many studies have coped well with the kinds of problems mentioned above, and the kind and quality of research are improving substantially, despite the complex nature of the field.

Continuum of Types of Research

If viewed as a continuum, experimental research on teaching may begin with the laboratory ideal of the true experiment. Then, by compromising some control, the quasi-representative designs compromise and adapt the experimental situation still more (Snow, 1974; after Brunswik, 1956).

The representativeness of a design is the degree to which the methodology of the research fits the multi-dimensional nature of classroom teaching and learning. When the design is made "representative" of the reality of the classroom, not the laboratory, it depends on rich description and naturally occurring processes and deemphasizes manipulation and control. As such, the representativeness of designs provides a dimension of research on teaching that may rectify the short-comings of field experiments, because it is perhaps more suitable to the task at hand.

Like true experiments, however, true representative designs are extremely difficult to attain. They make demands on the instructional

situation that usually cannot be met, such as completely random sampling of students. But quasi-representative designs compromise true representativeness, just as quasi-experimental designs are compromises of true experiments.

The steps necessary to move from systematic to representative design were illustrated by Snow in Figure 6. In brief, Figure 6 indicates how population and ecological representativeness may increase as the research provides for (a) a move from the laboratory to the classroom with rich, but unobtrusive, description of population characteristics and processes, (b) "detailed accounts" of student background and aptitude variables, (c) instructional treatments of ample duration accompanied by efforts to prepare students for any changes that may occur in their regular routines, (d) multiple outcome measures, including information on student attitudes and emotional responses to instruction, and (e) follow-up experiments in which key factors of the design are systematically omitted to discover "how and why" they worked. Owing to these differences in emphasis, true experimental and highly representative research necessarily possess different kinds of advantages. Yet for research on teaching such advantages are complementary. Knowledge gained from experimental research is "heavily fragmented and task specific" (Snow, 1974, p. 268), while knowledge gained from representative design provides "molar descriptions" of naturally occurring classroom behavior (p. 269). Both types of information are valuable and, in the right situation, one can extend and enrich the other. Obviously, different designs will work better for different empirical situations, depending on the purposes of the research.

A Model of Flow of Effects in Research on Teaching

Variables in research on teaching have been categorized by Mitzel (1960) and later by Dunkin and Biddle (1974) as presage, context, process, and product, respectively. Presage variables include teacher characteristics, such as age, sex, personality, teaching experience, education, etc. Context variables include grade level, subject matter, physical environment, organizational scheme (e.g., team teaching), etc. Process variables are classroom behaviors and interactions of both teachers and students, such as asking higher order questions, using student ideas, and

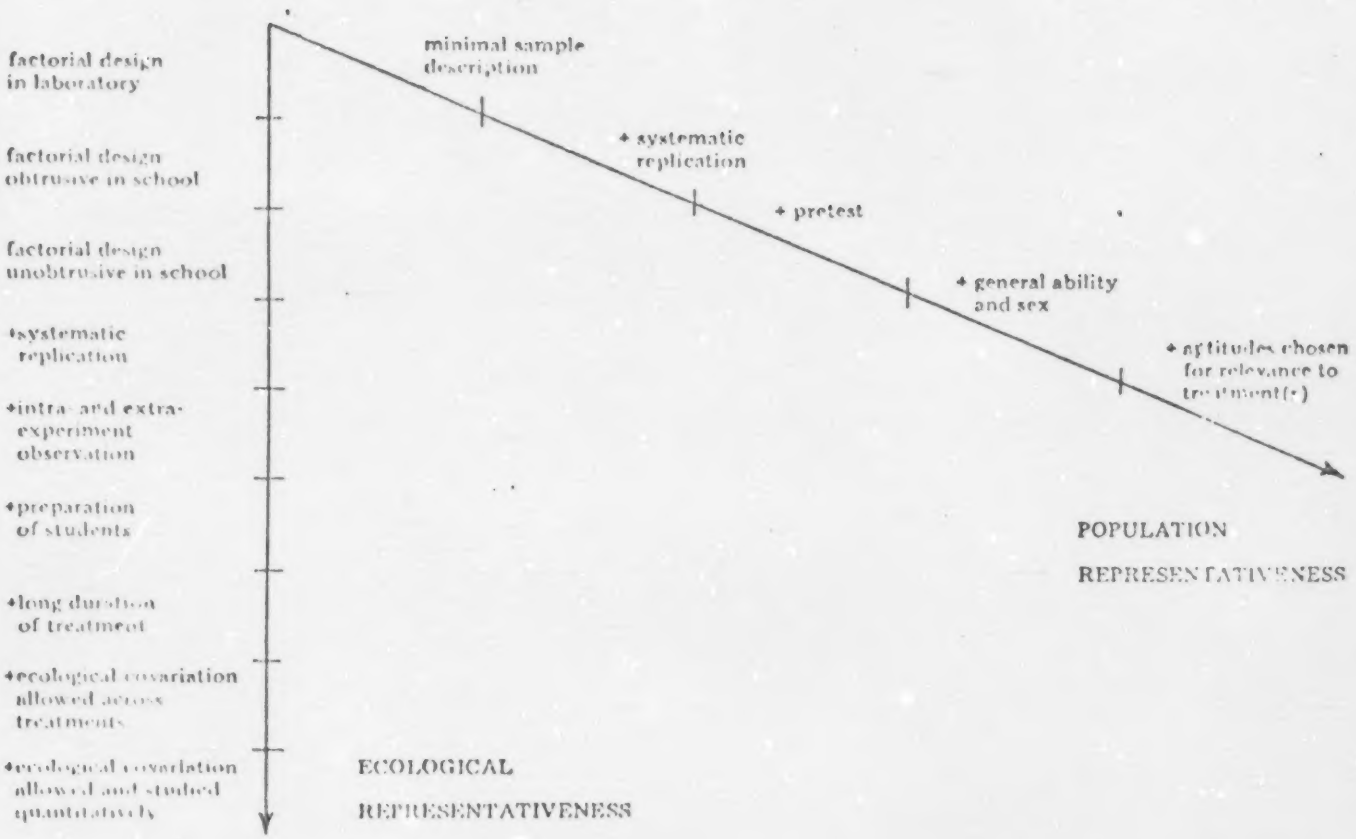

Fig. 6. Schematic scales of population and ecological representativeness in instructional experiments. (From Snow, 1974, p. 276).

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learning by discovery. Products are measures of student achievement, attitude, and the like.

Emphasis on these kinds of variables have changed during the 50 years or so in which recognizable research on teaching has gone on. Initial efforts at research on teaching tended to relate teacher traits to student achievement; these were presage-product studies. Because the teacher characteristics chosen were often poorly defined and because mediating-process variables were not considered, results of these studies told little about the actual effects of the traits on students. Studies of the effects of teacher training on teacher behavior came later and yielded substantially more information. From such presage-process studies, we know, for example, that teachers can be trained to exhibit certain kinds of behavior at will (see, for example, Joyce & Weil, 1972). Process-process and presage-process-process studies indicated further that trained or untrained teacher behaviors can affect student behavior in complex and multidimensional ways. A more recent effort, widespread primarily in the last 15 years, has been to relate process variables to product variables. These studies examined the effects of various modes of classroom interaction (teaching skills, strategies, and styles) on student achievement and attitude, or "criterion," variables. Here, somewhat consistent findings are beginning to be discernible.

The ATI Model

A subsequent phase in research on teaching deserves separate explanation. It is the most recently organized body of research on teaching, as well as the most complex. The concept of aptitude-treatment interaction (ATI) was proposed formally by Cronbach in 1957, but traces of an ATI "philosophy" are notable in much earlier writings. Cronbach and Snow (in press) have written a comprehensive and critical review of existing ATI research. ATI research determines whether one method of instruction is more suitable for other learners. For example, some students learn better if material is structured for them, and other students will benefit from greater flexibility and freedom of expression. For some pupils, teachers need to develop or improve their skills in classroom management; for other pupils, the more important need is to learn to pose higher

order questions. The same logic applies when the teacher is the learner. Very likely, the training environments that most benefit some teachers will differ from those that are best for teachers with a different level of various "aptitudes." Put simply, people have different needs and abilities, which make different kinds of treatment (or teaching) optimal for them.

ATI research seeks to validate this basic hypothesis empirically. According to Cronbach (1975), "the typical ATI study is a two-group experiment" (p. 116). A sample of learners is measured on some aptitude (any characteristic, such as a cognitive ability or a personality trait, that affects a person's response to instruction). Students are then assigned to one of two instructional treatments that have been hypothesized to have different effects on different aptitude groups. One or more outcome measures are obtained to gauge learner response to the instruction. For each of the treatment groups, the outcome measures are regressed onto the aptitude scores. If the plotted regression lines in the two treatments differ in slope (are not parallel), the aptitude and the treatment are said to interact. The two treatments are differentially effective along the aptitude scale, as shown in Figure 7.

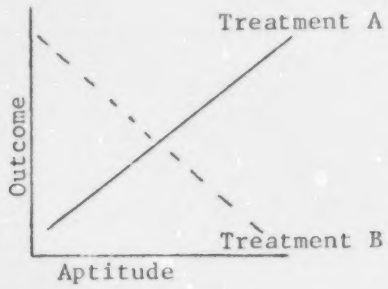

Figure 7. An aptitude-treatment interaction.

Thus ATI studies are studies presage-process-product. The presage variables are learner characteristics, the process variables are the instructional treatments, and the products are the measures of achievement.

One study showing as conclusive results as any in the literature reviewed by Cronbach and Snow is that of Domino (1971). Extremes of a distribution of college psychology students were classified "high

achievement via independence (Ai)," or "high achievement via conformity (Ac)," according to their scores on respective subscales of the California Personality Inventory. High Ai students prefer to "set tasks" for themselves; high Ac students prefer more guidance in learning. Domino arranged for an introductory psychology teacher to teach four classes (of 22 high Ai or high Ac students each) in two different ways: in two of the four classes, the instructor encouraged independence; in the other two he pressed for conformity. Analysis of four outcome measures showed students obtained higher scores when their preferred learning style "matched" the instructor's requirements:

> All but one of Domino's dependent variables showed the ATI he had predicted. (The exceptional variable was a measure of originality. On this, the independent student had an advantage no matter how the class was operated.) (Cronbach, 1975, p. 117).

Domino's study is exemplary, not only because it found significant aptitude-treatment interactions, but because the research methodology was sound and the hypotheses were strengthened by an earlier correlational study (Domino, 1968).

The peculiar complexity of ATI hypotheses has led Cronbach and Snow to advocate certain research procedures for this type of work. The most basic of these include large samples (for adequate statistical power), instructional treatments of substantial (real-world) duration, multiple outcome measures (because instruction has many effects on students), and regression analysis (to maximize variance accounted for). The only notable flaw in the design of Domino's study was the use of extreme aptitude groups; this reduced the sample size from 348 to 88--a sizeable loss of cases, more of which would probably have bolstered his results (Cronbach & Snow, in press). What is perhaps most important, however, is that Domino took time to carry out a naturalistic test of his hypothesis (that a teacher demanding conformity would get poorer results from high Ai students than if he permitted more independence) before conducting an experiment. Domino had sound analytical and empirical bases for his hypotheses--instead of only educated guesswork. These are two major criticisms Crobach and Snow make of ATI research to date--(a) research

methodology is often flawed, or unsuitable for effectively testing for interactions; and (b) studies are one-shot experiments, sometimes severly lacking in conceptual and analytical rationale. While these problems are serious, ATI research on the whole is still a young and growing field of endeavor. As Cronbach and Snow pointed out,

> ATI methods and ideas have a fundamental role to play in educational evaluation as well as educational design, and in psychological science, generally. As the role unfolds, expect new lines of research (benefitted by knowledge gained to date) to reopen old questions and to define issues not considered by traditional experimental and correlational investigations.

Theory in Research on Teaching

In most branches of science, research seeks to establish generalizations (laws, principles, or propositions) upon which cohesive theory can be built. Refined theory (as explanation and understanding) is the end to which systematic research is the means; both, when fruitful, contribute to practice. While analytic philosophy suggests that this is the way in which science proceeds, much research is conducted with no eye towards formal theory at all, but rather to prove or disprove, say, an idea whose time has come. This actual way that researchers often work has been cause for reconsideration of the role of theory and theorizing in scientific endeavor (cf., e.g., Boring, 1963). In educational and psychological research, specifically, this problem has considerable attention in recent years (Gage, 1972)--controversy that has led to a broader, generally encompassing, use of the term theory.

Gage (1963) has argued that theories are implicit in all human thinking; the extent to which they are explicated and systematized is the difference between the "man on the street and the research worker" (p. 94). And theories can serve productively as means as well as ends in themselves. "As means,...theories allow the research worker to straighten out his thinking, to bring order to his concepts and hypotheses, and perhaps, to rationalize what he is doing" (p. 99). Ideas about the usefulness of theorizing in guiding educational research were expanded and elaborated by Snow (1973) in the form of six "Grades of Theory" (after Boring, 1963). In addition to formal, "axiomatic" theory ("A-theory"),

which forms a logical network, Snow defined a range of decreasingly rigorous grades of theory "of potential value in developing research" (p. 83). These include such things as concepts and constructs for simplifying relationships among variables ("C-theory"); taxonomies (such as Bloom's), which help to develop working systems ("D-theory"); and hypotheses for conducting research ("F-theory"). Each is a step removed from formal A-theory, but each serves to advance knowledge and understanding in the field.

Along with this kind of thinking about the role of theory in education, there has arisen a general dissatisfaction with theoretical progress in psychology (cf., e.g., Campbell, 1973; Cronbach, 1975; Glass, 1972). Still holding a formal, traditional, definition of theory (Snow's A-theory), Suppes (1974) hailed theorizing as the primary responsibility of psychological research, while Cronbach (1975) admonished psychology for "too narrow an identification with science," a fault that "has fixed our eyes upon an inappropriate goal" (p. 126). Cronbach's reasoning coincides with the argument by Snow (1974) for more representative designs in educational research.

Chapter IV. THE "LEARNING THAT" COMPONENT OF TEACHER EDUCATION

Thus far, this treatment of the Systematic Teacher Training Model has dealt with the context and concept of such a model, with the role of research and development in teacher education, and with theory and method in research on teaching. In dealing with the context and concept, in Chapter I, we provided an overview of teacher education in the context of educational concerns at large. We also dealt with the processes of teaching and learning and the ways in which they interact with characteristics of the curriculum and the student so that broad generalizations and principles concerning these processes may be difficult, if not impossible, to achieve and follow. In that introductory chapter, we also offered speculations concerning the future of teacher education and research on teaching. We concluded with a design for evolutionary change in teacher education.

In Chapter II, we dealt with research and development in teacher education in the 1960s. We considered various technological developments--systems approaches, microteaching, protocol and training films, and flexible scheduling. Performance-based teacher education was examined in the context of the Model Elementary Teacher Education Programs and of training complexes, considered as devices for integrating many of these developments.

In the 1970s, humanistic reactions to performance-based teacher education appeared and obtained a considerable audience. As one result, such devices as portal schools and teaching centers are seen as becoming more prominent in teacher education for the future.

Then, in Chapter III, we considered the role of certain aspects of theory and method in research on teaching. Substantively complex interactions characterize relationships among variables and factors in teaching. Logistically, the Centers and Laboratories have provided major new ways of organizing research and development in the field. Methodologically, the aptitude-treatment interaction (ATI) model provides a way of coping with some of the substantive complexities. Finally, we

noted that useful theories can take a number of forms that range, in descending order of rigor, from the ideal of formal axiomatic systems to the level of concepts, constructs, taxonomies, and hypotheses.

The Stages of Teacher Education

The present chapter deals with the operation of a Systematic Teacher Training Model. We begin with a portrayal of the stages of teacher education--beginning with the first early decisions on the part of an adolescent or young adult to consider teaching as a career. From that point, we sketch the successive stages through which such a person must pass on the way to becoming a mature, competent, professional teacher.

In the kinds of preparation considered in this chapter, teachers are engaged primarily in "learning that," as distinguished from "learning how." This distinction, made by Ryle (1949) and since then much further analyzed (e.g., Roland, 1961), deals with the difference between the ability to state factual propositions and the ability to perform skills or operations. In this chapter, we take up the "learning that" part of teacher education programs. In the following chapter, we take up the "learning how" part. The latter are distinguished in that they can be learned only through practice. An example of the distinction is that you can learn that acids will neutralize bases as a factual proposition, and you need not have practiced the ability to state that proposition. But you cannot swim or speak French without at some time having practiced swimming or speaking French. Applied to teaching, this distinction means that, however much prospective teachers may have learned in all of the kinds of courses described in this chapter, they will not be able to teach unless they had had some practice in teaching. This intuitively appealing notion has resulted in the provision for practice teaching in various forms in teacher education programs. Many students of the teacher education problem, such as Conant (1963), regarded practice teaching as the single most valuable component of teacher education programs.

Deciding to Enter Teaching

How do persons decide to consider and to enter into teacher education programs? The processes here are, of course, akin to those that occur in making decisions about any kind of career. But, in the case of teachers, the young decision maker has had more exposure to the practitioners of the vocation than they have had to any other occupation. All children occasionally see policemen, physicians, carpenters, farmers, or automobile mechanics. They see none of these kinds of workers as frequently, or for so many hours per day as they see teachers during the weeks and months of their first eighteen years. Thus, they acquire a kind of familiarity with the position and role of a teacher that is unparalleled in their experience with any other occupation.

The consequences of this long familiarity with the teacher's role are not well known, but we may offer some conjectures. First, according to the child's own social class background, the teacher may represent a person of higher social status. Or, in many communities, the teacher may be a person who, although considered a "professional," is someone less well paid and lower in status, despite higher educational attainments, than the student's parents or neighbors. In the latter situation, the teacher may be perceived as a person wh material rewards and authority are not commensurate with those of persons in other professions that require a college education, such as engineering, law, or medicine.

Similarly, the young person sees that teachers are in almost constant interaction with people--younger people for the most part, but also adults, such as parents, fellow teachers, or school administrators. Further, young people see the teacher as a person with authority--authority over persons who are weaker, younger, less well educated, and subject to the teacher's power and authority. Many persons other than teachers--persons of equal age, educational level, and income--do not do their daily work in such obvious dominant-submissive relationships with other people, especially younger people.

Finally, the young person in the later years of high school or the early years of college--the late adolescent who begins to consider teaching as a career--must surely begin to see that teaching must be in

principle, and often is in actuality, a non-self-serving activity. It is an occupation where an ethical code prescribes concern with the welfare of others, with one's students as individuals, and with the good of the whole society. Unlike such occupations as farmers, service station operators, bankers, and longshoremen--the private entrepreneurs and workmen whose numbers are largest in the American economy--teaching is seen as, and is indeed, a "social service" occupation, similar in this sense to doctoring, nursing, social work, counseling, and the ministry.

Either at entrance to college, or sometime in the first two or three years of college, all of these conceptions about the role of the teacher interact with the student's developing conceptions about himself or herself. Somehow this interaction of conceptions leads to a tentative prediction of a possible good fit. Positive and negative forces operate on the developing self concept. The student begins to see that he or she is not very good at some things and possibly good, or even excellent, at others. Some activities turn out to be drudging and aversive, while others are pleasant, even exciting and delightful. Some activies are seen to be far above the station in life to which one can realistically aspire because they require more ability or money than one can bring to preparation for them. Thus, many students quickly cross off careers as research physicists because they lack the mathematical aptitude, or careers as physicians because they know they will never be able to raise the tuition, or careers as actors because they know they will never feel comfortable performing before a public.

Krumboltz (no date) has outlined a social-learning theory of career decision-making. The theory posits four categories of influences: genetic endowment and special abilities, environmental conditions and events, learning experiences, and task-approach skills. The interactions among these kinds of influences have three kinds of consequences: self-observation generalizations, task-approach skills, and actions. A self-observation generalization is an overall evaluation of one's own general performance as compared with certain standards. Most important, these generalizations eventuate in preferences for some kinds of tasks and

dislikes of others. The task-approach skills include all those entailed in coping with, interpreting, and making predictions about events. And the actions take such forms as applying for a job, seeking admission to a training program, or accepting a promotion.

The process of career planning and development consists of a series of instrumental and associative learning experiences resulting in self-observation generalizations and task-approach skills, all consequent upon the particular set of genetic factors that the individual is born with. In this sequence, the person makes choices that bring about one's current activity. Krumboltz illustrated this process as follows:

> Barbara was born in the year 1944, influenced by the war, a new public library being built by her home, a charismatic Sunday-school teacher, a boyfriend killed in Vietnam, and various factors affecting women's expectations to have careers.

Barbara decides at this point to be a teacher. We shall not consider here what happens next, or any of the infinite number of alternative paths that she might have followed.

What Krumboltz's model provides is a way of organizing thinking about the processes and factors that enter into a person's career decision-making, including the decision to try to become a teacher. His model suggests testable propositions, such as the following: One prefers activities, courses of study, occupations, and the like if one has been positively reinforced in related activities. One prefers activities that one has observed a valued model being reinforced for engaging in related activities. One prefers activities to the degree that one has been consistently reinforced by a valued person who modeled that kind of activity. Exposure to positive words and images, punishment or lack of reinforcement, observing a model receive punishment or no reinforcement, being reinforced by a valued person who expresses negative opinions about an activity--all these are examples of processes whose effects could be tested in relation to decisions to seek admission to teaching.

Autobiographies are full of mentions of teachers who inspired or depressed, raised one's spirits or cast one into the depths. Many young people, seeing positive models among their own teachers, begin to conceive of the possibility that they can play such parts in the lives of

young people, and the image becomes appealing.

Applying for Admission

Somehow, through processes of these kinds, the student applies for admission into a course or a program related to, or part of, teacher education. Now the young person begins to interact with the institutional mechanisms, the gateways and gatekeepers, that determine who is recruited and admitted into such courses and programs. The barriers to be hurdled for admission into teacher education programs in the United States are not high. Standards in terms of grade-point averages in previous college work may be set forth. The candidate must provide biographical data that bear upon his interests in other people, especially children and adolescents. Did he ever serve as a counselor in a summer camp? How much babysitting has she done? Did she ever have charge of a Girl Scout troop? Was he ever a playground supervisor? A swimming instructor? Questions of these kinds are posed in questionnaires and interviews. Students interested in becoming teachers are generally expected to have positive answers to some of them in order to be regarded as having the beginnings of the aptitude or temperament that teachers are supposed to need.

The self-selection processes operate so as to produce teachers who differ according to the kind of pupil and subject matter they will teach. According to Fuller and Bown (1975), research shows that teachers at the elementary and early childhood levels, as compared with secondary school teachers, are "warmer, more hopeful, more supportive, and less critical ...more exhibitionistic, more orderly, more dependent, less bright, and more consistent in their views,...more directive and teacher centered... encourage dependence" (p. 28). These differences exist prior to entrance into teacher education programs and somehow seem appropriate in that the differences between subgroups of teachers fit, on the average, the requirements and opportunities of the various subgroups (p. 28).

In some institutions, at certain points in their histories, personality tests have been given to determine whether students have at least the minimal level of mental health required to be at least not harmful

to children. Thus, on occasion, such instruments as the Minnesota Multiphasic Personality Inventory have been used to screen out persons considered potentially harmful--persons such as psychopathic inferiors. But experience with such devices has generally not been rewarding enough. Rejection rates have been so low as to make such test administration programs not worthwhile, and in most instances the use of such personality tests has been abandoned. Perhaps the discontinuation of the use of such instruments was hastened by the review by Getzels and Jackson (1963) of the teachers' personality and characteristics in the Handbook of Research on Teaching; in that chapter, it appeared that none of the instruments that had been fairly widely used in research up to 1960 had had relationships to ratings or other criteria of teacher effectiveness that were high or consistent enough to be useful.

Going Through the Program: Learning That

At any rate, once the student is involved in a teacher education program, he begins to take courses and get involved in "practical" experiences. The courses fall into a fairly uniform pattern throughout the United States.

> The prospective secondary school teacher can reasonably be predicted to have completed, regardless of where the training was obtained, three preparatory courses (nine to twelve semester credit hours) including "introduction to education," "educational or adolescent psychology," "general methods in secondary education"; one methods course (generally three credit hours) in the teaching field of specialization; and a student teaching experience (usually of one-half semester's duration). The pattern for prospective elementary school teachers involves more professional course work, but is equally uniform. Added to the secondary pattern described above are some eighteen to twenty semester hours of methods in reading, social studies, mathematics, science, and art and music--all necessary because the elementary school teacher will ordinarily function in a self-contained classroom unit and will be responsible for teaching the full range of subjects (Clark & Marker, 1975, p. 56).

Let us elaborate a bit on this characterization of the teacher education program.

Early in the series of courses the one entitled something like An Introduction to Education gives the future teacher a wide variety of

ideas, information, and concepts about the organization of education in the United States--how it is financed and administered, and, especially, the nature of the teacher's role. Although the course is well-nigh universal, satisfaction with it is usually low on the part of both the faculties and the students in teacher education programs. No detailed consensus concerning its content has emerged during the decades in which such courses have been offered and in which the many textbooks for such courses have appeared.

Further the prospective teacher may take a series of courses or parts of courses dealing with the philosophical, historical, social, and psychological aspects of education. In the philosophical field, he receives ideas largely taken from John Dewey--concepts and principles that set forth democratic values, the role of school in society, the importance of individuals and their needs and interests, the role of experience in education, and the importance of incidental learning. Also included is some indoctrination against formalism (usually considered "empty"), uniformity, and highly structured, teacher-dominated approaches to education.

The historical introduction may deal with education throughout the world, especially in the West, but emphasizes the history of American education. How the Founding Fathers perceived the importance of education in realizing the American Dream, the role of Horace Mann in founding public universal education, and the increasing equality of educational opportunity in the 19th and 20th centuries--all these themes get filled in for the prospective teacher. The candidate may also learn that, during the 20th century, schools began, in the view of some historians, to be operated according to an "industrial" model. Students may be regarded as products to be processed through schools in ways not unlike automobiles on an assembly line. Criteria of productive efficiency and the cost-benefit ratio were, in this view, applied to education in ways that are still current in such forms as the accountability movement.

In the realm of social forces, students learn about how the

classroom and school fit into society--its political, economic, and social institutions. They also learn about the social structure and functioning of the school system--how its components relate to one another. Social class differences between and within communities influence the economic base on which the educational system rests. The power structure of the community affects the composition of the state and district school boards and other governing bodies. The relationships between the school board and the superintendent, between the school principal and the teachers, between the teachers and their students' parents, and between the teachers and their students--all these are introduced to students. In recent years, students have learned about microstructures and person-to-person relationships as well. Thus, the sociology of education shades off into the social psychology of education--interpersonal relationships and interpersonal perceptions.

In courses in educational psychology students are introduced to learning, developmental processes, and evaluation. Recently, such courses have gone into the formulation of educational objectives and, still more recently, into the teaching process itself. The basis for much of what goes into the training of the teacher, in the sense of giving the teacher ability to perform or act in certain ways, is laid in this course. Here teachers can learn about different strategies, styles, and skills of teaching. Ways of understanding the relationships of teacher behavior to student achievement and attitude have been subjected to much investigation. The results of these investigations are beginning to be included in educational psychology. The learning process is still considered central. But teachers are being required less to infer what such research implies for teaching. Instead, they are being provided with content that draws directly on the empirical relationships between what teachers do and what students learn. Further, research on educational objectives, their varieties and structure, has yielded ideas for use by teachers in organizing, planning, and evaluating their curricula. These new developments have occurred alongside a continuing concern with measurement and evaluation, i.e., with tools for estimating students'

abilities, achievements, and characteristics before and after instruction. New formulations, such as criterion-referenced testing to reveal specified attainments, have achieved prominence alongside norm-referenced testing to reveal individual differences in general achievement.

Beyond the introduction to education and these various kinds of courses in education, prospective teachers take courses similar to those of all college students to acquire a general, or liberal, education. Like all educated persons, teachers should have at least an elementary grasp, perhaps at the level acquired in the secondary school but also in many cases at the college level, of the natural and social sciences and the humanities. Thus, teachers ought to know something about the physical and biological sciences, about history, politics, economics, about literature, art, and music.

Beyond such a liberal education, teachers should have a special knowledge of the subject or subjects they are going to teach. For elementary school teachers, this means a special grasp of the nature of subjects already noted, along the lines on which these subjects are taught to children between the ages of six and fourteen. At the secondary school level, teachers concentrate on special subjects and are expected to have the equivalent of an undergraduate major in that subject. Thus, prospective science teachers take college courses in chemistry and physics, and the same is true of prospective high school teachers in mathematics, biology, history, economics, political science, foreign languages, English literature and composition, music, art, and physical education. It has not been possible to demonstrate any consistent correlation between a teacher's knowlege of a subject, as measured by a standardized achievement test, and the achievement of the teacher's students in that subject. Yet the tenet that teachers ought to know what they are going to teach prevails.

Alongside the subject matter, the prospective teacher receives special courses on curriculum and instruction in that subject matter. These courses deal not so directly with the subject matter itself as with what should be taught to students at given levels of maturity and

also with the ways in which that subject matter should be taught. Thus, courses in curriculum and instruction bring the teacher very close to these aspects of professional preparation that are intimately related to what the teacher will do in the classroom. To the layman, the curriculum in well-established subject matters seems to be a static thing. Arithmetic, for example, is not considered to have changed in the forty years since one studied it oneself. But professional students of such matters see the arithmetic curriculum as a field full of issues that need to be reconsidered continually--thus in recent decades, the "new math," and then the reemergence of the "old math." Other subject matters are less well established than mathematics, and more recent in man's intellectual history--subjects such as literature, history, and the natural sciences. Here it is even easier to appreciate continuing reexamination of what should be taught and how it should be taught. As professionals, teachers need intellectual tools for thinking about curriculum and teaching methods. In these courses, they are exposed to the thinking of scholars in these matters and can think the problems through for themselves. When they enter the school, they can help make choices among textbooks, teaching materials, learning experiences, classroom organization schemes, and instructional procedures.

A Comprehensive Conception of Teaching

Before we can go into the ways in which the practice component of teacher education can and should be organized, we need a general conception of teaching. That conception should be catholic enough to embrace the many alternative strategies of teaching that are appropriate for different educational objectives and students. One cardinal principle that has emerged from decades of study of teaching methods is that no one method is best for all objectives and all students. Rather, the ideal way to teach is one that is uniquely appropriate to the specific kinds of things to be learned by particular students.

In this conception, it is implicit that there are a variety of strategies of teaching. Such a variety has long been recognized by

students of teaching. And the varieties need categorization. One way to categorize these strategies of teaching is based on the number of students to be taught at the same time and place. That number can be

(a) 1, that is, an individual student working alone, or with a teacher

(b) a group ranging in size from 2 to 20 students

(c) a group ranging in size from 20 to 40 students, which is the size of the typical "class" in the United States and most of the world, and

(d) a group of more than 40 students.

For one student at a time, the strategies that suggest themselves are tutoring, requiring students to do homework or seatwork, programmed instruction, computer-assisted instruction, and so-called personalized systems of instruction (the Keller plan). Such individual instruction entails having the student work with an appropriate set of materials, often a book or workbook, but also possibly a piece of equipment, a game, a puzzle, a tool, or whatever.

When the group includes two to twenty students, the prototypical strategy is the discussion method, in which the students do much of the talking, giving and taking facts and arguments in an attempt to resolve an issue or explore a theme, while the teacher serves as chairperson, referee, and occasional clarifier.

When the group consists of approximately forty students or more, the typical method is the lecture, since there are too many students to make a genuine discussion possible. Television and films are also used with such large groups. There may be interruptions of the lecturer, questions from the floor, and the like. As these increase in frequency and intensity, the lecture can shade off into a kind of teacher-centered discussion.

Finally, the most frequently occurring group size is the classroom group of twenty to forty students--a range that would include the vast majority of the classrooms in the United States, with a median centering around thirty students per class. Although teachers and their organizations have argued for years that this typical class size should be

reduced, such reductions appear unlikely in the near future. Estimates indicate that they would increase the annual cost of instruction by hundreds of millions of dollars in one state alone (Berliner & Gage, 1975, P. 19). In the classroom one major way of teaching has been the "recitation," characterized by relatively rapid exchanges of questions asked by the teacher and answers by the students. The recitation is occasionally interspersed with short episodes in which the teacher provides "structuring" or "reacting" to students' responses.

Classroom teaching, in our view, should and often does consist not only of the recitation but of the methods mentioned above in relation to smaller and larger numbers of students. Thus, classroom teaching may at times include tutoring, discussion, or lecturing, as well as the recitation. In this conception, the classroom teacher will "orchestrate" the various teaching strategies with his group of 20 to 40 students. Sometimes she or he will indeed conduct a recitation. But, at times she will work with a single student, providing tutoring, individual attention, a word of advice, a new assignment, while the remainder of the class is otherwise occupied. At times, the classroom teacher will arrange for a small-group discussion of a given topic, or role playing, by five or ten students, with either the teacher or a student serving as chairman and group leader. Again, the remainder of the class will be otherwise occupied or also engaged in small-group discussions. Finally, the teacher will at times lecture, play recordings, or show films or television programs, treating his or her class as a single large group.

Each of these major strategies, classified according to the number of students involved, has advantages and disadvantages for different kinds of educational objectives. Briefly stated, the advantage of tutoring and other kinds of teaching suitable for one student at a time is that of making possible highly individualized diagnosis and prescription. The misunderstandings unique to one student can be remedied. The student can be permitted to go at his own pace. Extra assignments will allow a highly capable student to fulfill his potential. Additional practice on difficult parts of a skill can be arranged.

Similarly, small-group discussions permit students to gain practice in expressing themselves orally, understanding others' arguments, and learning to participate in the give-and-take of group processes without becoming unduly involved in their own positions. Here students learn how to stay rational even when discussions become heated.

The lecture, film, and demonstration have advantages for allowing students to hear and see another person, or some other kind of model grapple with an intellectual problem. Since lecturers vary widely, students can experience a correspondingly wide array of types of models of "man thinking." There is the well-known objection that whatever can be lectured can be read more quickly, with opportunities for going back on what has been missed the first time. The reply is that hearing and seeing a lecturer have the same advantages of greater interest and involvement that hearing and seeing a play have over reading a play. Even though all the ideas in the script can be read, the hard-to-pinpoint additions provided by the lecturer or actors can add new dimensions of interest and motivation.

References

Administration and Supervision National Field Task Force on the Improvement and Reform of American Education. Institutional viability. DHEW Publication No. (OE) 74-12006.

Allen, D., & Ryan, K. Microteaching. Reading, Mass.: Addison-Wesley, 1969.

Allen, W. H. Audio-visual communication. In C. W. Harris (Ed.), Encyclopedia of educational research (3rd ed.). New York: Macmillan, 1960. Pp. 115-137.

Aspy, D. N. & Roebuck, F. N. Research Summary: Effects of training in interpersonal skills. Interim Report No. 4 National Institute of Health. Monroe, La.: National Consortium for Humanizing Ed., Northwest Louisiana University, 1974.

Atkinson, R. C., & Wilson, H. A. (Eds.). Computer-assisted instruction: A book of readings. New York: Academic Press, 1969.

Bandura, A., & Walters, R. H. Social learning and personality development. New York: Holt, Rinehart and Winston, 1963.

Beck, W. R. Pupil's perception of teacher merit: A factor analysis of five postulated dimensions. Unpublished doctoral thesis, Stanford University, 1964.

Beller, E. Research on organized programs of early education. In R. M. W. Travers (Ed.), Second handbook for research on teaching. Chicago: Rand McNally, 1973.

Bergquist, C. C. & Graham, D. L. Methodological considerations for the validation of teacher competencies. Paper presented at the Meeting of the American Educational Research Association, Washington, D.C., April, 1975.

Berliner, D. C. Microteaching and the technical skills approach to teacher training. Stanford, Cal.: Stanford Center for Research and Development in Teaching. Technical Report No. 8, 1969.

Berliner, D. C., & Gage, N. L. The psychology of teaching methods. In N. L. Gage (Ed.), The psychology of teaching methods: The Seventy-fifth Yearbook of the National Society for the Study of Education. Part 1. Chicago: University of Chicago Press, 1976.

Biddle, B. J. Methods and concepts in classroom research. Review of Educational Research, 1967, 37, 337-357.

Bishop, L. J. Staff development and instruction for improvement. Boston: Allyn & Bacon, 1976.

Borg, W. R. The minicourse as a vehicle for changing teacher behavior. Journal of Educational Psychology, 1972, 63, 572-579.

Borg, W. R., Kelly, M. L., Langer, P., & Gall, M. The minicourse: A microteaching approach to teacher education. Beverly Hills, Ca.: Macmillan, 1970.

Boring, E. G. The role of theory in experimental psychology. In R. D. Watson & D. T. Campbell (Eds.), History, psychology, and science: Selected papers by E. G. Boring. New York: John Wiley, 1963.

Bosley, H. E., & Wigren, H. E. (Eds.) Television and Related Media in Teacher Education. Baltimore, Md.: Multi-state Teacher Education Project, 1967.

Brooks, E. D. The effect of alternative techniques for modifying teacher behavior. Unpublished doctoral dissertation, Stanford University, 1967.

Broudy, H. S. Historic exemplars of teaching method. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Broudy, H. S. A critique of PBTE. Washington, D.C.: American Association for Colleges of Teacher Education, 1973.

Brunswik, E. Perception and the representative design of psychological experiments. Berkeley, Ca.: University of California Press, 1956.

Burdin, J. L., & Lanzillotti, K. A reader's guide to the comprehensive models for preparing elementary teachers. ERIC Publication No. SP 003 421, 1969.

Burdin, J. L., & Mathieson, M. B. A review of the research on competency-based education. In R. W. Burns & J. L. Klingstedt (Eds.), Competency-based education: An introduction. Englewood Cliffs, N. J.: Educational Technology Publications, 1972.

Burke, C. The individualized, competency-based system of teacher education at Weber State College. Washington, D. C.: American Association of Colleges for Teacher Education, 1972.

Burns, R. W., & Klingstedt, J. L. (Eds.). Competency-based education: An introduction. Englewood Cliffs, N. J.: Educational Technology Productions, 1972.

Bush, R. N., & Allen, D. W. A new design for high school education. New York: McGraw-Hill, 1964.

Campbell, D. T. The social scientist as methodological servant of the experimenting society. Policy Studies Journal, 1973, 2, 72-75.

Campbell, D. T., & Stanley, J. C. Experimental and quasi-experimental designs for research on teaching: In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Clark, D. L. & Marker, Gerald. The institutionalization of teacher education. In Kevin Ryan (Ed.), Teacher education: The Seventy-Fourth Yearbook of the National Society for the Study of Education, Part II. Chicago: University of Chicago Press, 1975.

Cogan, M. L. Research on the behavior of teachers: A new phase. Journal of Teacher Education, 1963, 14, 238-243.

Cohen, S. B. A five-year goal for training complexes. In B. Rosner (Ed.), The power of competency-based teacher education: A report. Boston: Allyn and Bacon, 1972.

Coleman, J. S., et al. Equality of educational opportunity. Washington, D. C.: U. S. Government Printing Office, 1966.

Combs, A. W. The professional education of teachers. Boston: Allyn and Bacon, 1965.

Combs, A. W. Some basic concepts for teacher education. Journal of Teacher Education, 1972, 22, 286-290.

Combs, A. W., & Kinzer, S. M. The University of Florida's childhood education program: An alternative approach to CBTE. In W. R. Houston, (Ed.), Exploring competency-based education. Berkeley, Ca.: McCutchan, 1974.

Community National Field Task Force on the Improvement and Reform of American Education. A real alternative. DHEW Publication No. (OE) 74-12007.

Conant, J. B. The education of American teachers. New York: McGraw-Hill, 1963.

Cook, T. D., & Campbell, D. T. The design and conduct of quasi-experiments and true experiments in field settings. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand McNally, 1976.

Corno, Lyn. Establishing university-based teacher centers: Relevant issues and specific recommendations for action. Unpublished paper, Stanford Center for Research and Development in Teaching, 1976.

Corno, L., & Stayrook, N. G. Student achievement in teacher center schools: An evaluation of West Virginia's Multi-Institutional Teacher Education Center. Stanford, Ca.: Manuscript in progress.

Corwin, R. G. Reform and organizational survival. New York: Wiley, 1973.

Cronbach, L. J. The logic of experiments on discovery. In L. S. Shulman & E. R. Keislar (Eds.), Learning by discovery: A critical appraisal. Chicago: Rand McNally & Co., 1966.

Cronbach, L. J. Beyond the two disciplines of scientific psychology. American Psychologist, 1975, 30, 116-127.

Cronbach, L. J., & Snow, R. E. Aptitudes and instructional methods: A handbook for research on interactions. New York: I. Wigton Publisher, Naiburg Publishing Corporation. In press.

Domino, G. Differential prediction of academic achievement in conforming and independent settings. Journal of Educational Psychology, 1968, 59, 256-260.

Domino, G. Interactive effects of achievement orientation and teaching style on academic achievement. Journal of Educational Psychology, 1971, 62, 427-431.

Dunkin, M. J., & Biddle, B. J. The study of teaching. New York: Holt, Rinehart and Winston, 1974.

Eisner, E. Applying educational connoisseurship and criticism to educational settings. Paper presented at the annual meeting of the American Education Research Association, Washington, D. C., April 1975.

Elam, S. PBTE: What is the state of the art? Washington, D. C. American Association of Colleges of Teacher Education, 1971.

Estes, W. K. Learning. In C. W. Harris (Ed.), Encyclopedia of educational research (3rd ed.). New York: Macmillan, 1960.

Flanders, N. A. Teacher influence, pupil attitudes, and achievement. U. S. Department of HEW, OEO, Corporate Research Monograph, No. 12 (OE-25040). Washington, D. C.: U. S. Government Printing Office, 1965.

Florida State University. Conference on teacher education centers manual. Tallahassee, Fla., March 3-5, 1975.

Folley, J. D. (Ed.). Human factors methods for systems design. Report AIR-790-60-FR-255. Pittsburgh, Pa.: American Institutes for Research, 1960.

Fuller, F. F., & Bown, O. H. Becoming a teacher. In Kevin Ryan (Ed.), Teacher education: The Seventy-fourth Yearbook of the National Society for the Study of Education. Part II. Chicago: University of Chicago Press, 1975.

Gage, N. L. Paradigms for research on teaching. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Gage, N. L. Teacher effectiveness and teacher education: The search for a scientific basis. Palo Alto, Ca.: Pacific Books, 1972.

Gage, N. L., & Winne, P. H. Performance-based teacher education. In K. Ryan (Ed.), Teacher education. Seventy-Fourth Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1975.

Gagné, R. M. The analysis of instructional objectives for the design of instruction. In R. Glaser (Ed.), Teaching machines and programmed learning, II. Washington, D. C.: National Education Association, 1965.

Gagné, R. M. Human functions in systems. In R. M. Gagné (Ed.), Psychological principles in systems development. New York: Holt, Rinehart and Winston, 1962.

Getzels, J. W., & Jackson, P. W. The teacher's personality and characteristics. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Glass, G. V. The wisdom of scientific inquiry on education. Journal of Research in Science Teaching, 1972, 9, 3-18.

Glaser, R. Learning. In R. L. Ebel (Ed.), Encyclopedia of educational research (4th ed.). New York: Macmillan, 1969.

Glaser, R. (Ed.). Teaching machines and programmed learning, II. Washington, D. C.: National Education Association, 1965.

Glaser, R. (Ed.). Training research and education. Pittsburgh, Pa.: University of Pittsburgh Press, 1962.

Green, R. L. (Ed.). Racial crisis in American education. Chicago: Follett Publishing Co., 1969.

Green, R. L., Bakan, R. F., McMillan, J. H., & Lezotte, L. W. The urban school: Implications for educational improvement. R. M. W. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.

Heffernan-Cabrera, P. The potential for humanistic endeavor in CBTE. In W. R. Houston (Ed.), Exploring competency-based education. Berkeley, Ca.: McCutchan, 1974.

Higher Education National Field Task Force on the Improvement and Reform of American Education. Obligations for reform. Trial report and recommendations. Washington, D. C.: HEW Publication No. (OE) 74-12005.

Hilsinger, R., & Schantz, B. Philadelphia - The urban model. In L. Lutonsky (Ed.), Portal schools. Teacher Corps Monograph for Grant No. OEG-0-71-3354(716). Washington, D. C.: U.S. Office of Education, 1973.

Holland, J. G., & Skinner, B. F. The analysis of behavior: A program for self-instruction. New York: McGraw-Hill, 1961.

Holt, J. How children fail. New York: Pitman, 1964.

Houston, W. R., & Howsam, R. B. CBTE: The ayes of Texas. Phi Delta Kappan, 1974, 55, 299-303.

Houston, W. R., et al. Resources for performance based education. Albany, N.Y.: State University of New York, State Education Department, 1973.

Jackson, P. W. The teacher and the machine: Observations on the impact of educational technology. Pittsburgh: University of Pittsburgh Press, 1968.

Jamesville-Dewitt-Syracuse University Teaching Center. Statement of agreement. Syracuse, N.Y.: Department of Education, Syracuse University, Unpublished document, 1974.

Jamison, D., Suppes, P., & Wells, S. The effectiveness of alternative instructional media: A survey. Review of Educational Research, 44, 1974, 1-59.

Joyce, B. R. Variations on a systems theme: Comprehensive reform in teacher education. Interchange, 1970, 1, 83-95.

Joyce, B. R. Listening to different drummers: Evaluating alternative instructional models. In Competency assessment, research, and evaluation: A report of a national conference, University of Houston, March 12-15, 1974. Washington, D. C.: American Association of Colleges for Teacher Education, 1974.

Joyce, B. R. Conceptions of man and their implications for teacher education. In K. Ryan (Ed.), Teacher education. Seventy-Fourth Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1975.

Joyce, B. R.,& Weil, M. Models of teaching. New York: Prentice-Hall, 1972.

Joyce, B. R., Weil, M., & Wald, R. The teacher innovator: Models of teaching as the core of teacher education. Interchange, 1973, 4, 47-60.

Kerlinger, F. N. Foundations of behavioral research. (2nd ed.) New York: Holt, Rinehart and Winston, 1973.

Kirst, M. W., & Walker, D. F. An analysis of curriculum policy-making. Review of Educational Research, 1973, 41, 479-509.

Koerner, J. D. The miseducation of American teachers. Boston: Houghton Mifflin, 1963.

Kohl, H. Thirty-six children. New York: New American Library, 1967.

Krumboltz, J. D. A social learning theory of CDM. In Anita M. Mitchell, G. B. Jones, and John D. Krumboltz (Eds.), A social learning theory of career decision making. Palo Alto, Cal.: American Institutes for Research. Final Report, Contract No. NIF-C-74-0134. (no date)

Kuhn, T. The structure of scientific revolutions. Chicago: University of Chicago Press, 1964.

Lewin, K. Field theory and social science. New York: Harper, 1951.

Lewin, K., Lippitt, R., & White, R. K. Patterns of aggressive behavior in experimentally created social climates. Journal of Social Psychology, 1939, 10, 271-299.

Licklider, J. C. R. Preliminary experiments in computer-assisted learning and teaching. In J. E. Coulson (Ed.), Programmed learning and computer-based instruction. New York: Wiley, 1962.

Lumsdaine, A. A. Educational technology, programmed training, and instructional science. In E. R. Hilgard (Ed.), Theories of learning and instruction. Sixty-Third Yearbook of the National Society for the Study of Education, Part I. Chicago: University of Chicago Press, 19[illegible]

Lumsdaine, A. A. Instructional materials and devices. In R. Glaser (Ed.), Training research and education, Pittsburgh: University of Pittsburgh Press, 1962.

Lutonsky, L. (Ed.), Portal schools. Teacher Corps Monograph for Grant No. OEG-0-71-3354(716). Washington, D. C.: U.S. Office of Education, 1973.

Maccoby, E., & Jacklin, C. Psychology of sex differences. Stanford, Ca.: Stanford University Press, 1974.

Maddox, K. In West Virginia it's working. Washington, D. C.: American Association of Colleges of Teacher Education, 1972.

Mager, R. R. Preparing instructional objectives. Palo Alto, Ca.: Fearon Publishers, 1962.

Manlove, D. C., & Beggs, D. W., II. Flexible scheduling. Bloomington: Indiana University Press, 1965.

Masla, J. A., Sinatra, L. T., Arends, R. L., & Waite, H. W. Buffalo emphasizes special education. In L. Lutonsky (Ed.), Portal schools. Teacher Corps Monograph for Grant No. OEG-0-71-3354(716). Washington, D. C.: U.S. Office of Education, 1973, Pp. 33-50.

Maslow, A. Motivation and personality. New York: Harper & Row, 1954.

Matthews, C. C. The classroom verbal behavior of selected secondary school science students and teachers and their cooperation classroom teachers. Unpublished doctoral dissertation, University of Michigan, 1961.

McDaniels, G. L. The federal role in supporting research on teaching. Paper presented at the meeting of the Association of Colleges and Schools of Education in State Universities and Land-Grant Colleges. New Orleans, La.: October 13, 1974.

McNeil, J. D. Concomitants of using behavioral objectives in the assessment of teacher effectiveness. Journal of Experimental Education, 1967, 36, 69-74.

McNeil, J. D., & Popham, W. J. The assessment of teacher competence. In R. M. W. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973. Pp. 218-245.

Meister, D., & Rabideau, G. F. Human factors evaluation in systems development. New York: Wiley, 1965.

Millman, J., Popham, W. J., McNeil, J. D., & Baker, E. L. Teaching improvement kit. Los Angeles: Instructional Appraisal Services, 1972.

Miltz, R. J. Development and evaluation of a manual for improving teacher's explanations. Unpublished doctoral dissertation, Stanford University, 1971.

Mitzel, H. E. Teacher effectiveness. In C. W. Harris (Ed.), Encyclopedia of educational research (3rd ed.), New York: Macmillan, 1960.

Mursh, J. E., Burgess, G. G., & Smith, P. N. Student achievement as a measure of instructor effectiveness. Project No. 7950, Task No. 77243. Lackland Air Force Base, Tex.: Air Force Personnel & Training Center, 1955.

Muuss, R. G. Differential effects of studying versus teaching on teachers' attitudes. Journal of Educational Research, 1969, 63, 185-189.

Nash, P. A. Humanistic approach to PBTE. Washington, D. C.: American Association of Colleges for Teacher Education, 1973.

Nicholson, A. M., Joyce, B. R., Parker, D. W., & Waterman, F. T. The literature on inservice teacher education, ISTE Report III. Palo Alto, Ca.: Stanford Center for Research & Development in Teaching, 1976.

Peck, R. F., & Tucker, J. A. Research on teacher education. In R. M. W. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.

Popham, W. J. Development of a performance test of teaching proficiency. USOE, Final Report, Contract No. CE-6-10-254. Los Angeles: University of California at Los Angeles, 1967.

Program on Teaching Effectiveness, SCRDT. A factorially designed experiment on teacher structuring, soliciting, and reacting (R&D Memorandum No. 147). Stanford, Cal.: Stanford Center for Research and Development in Teaching, 1976.

Report of the Detroit High School Study Commission. Detroit, Mich.: Board of Education, 1968.

Report of Special Group D, The DeKalb Conference. The Users of Television in Teacher Education. Washington, D. C.: National Commission on Teacher Education and Professional Standards, NEA, 1955.

Rogers, C. Freedom to learn. Columbus, Ohio: C. E. Merrill, 1969.

Roland, Jane. On the reduction of "knowing that" to "knowing how." In B. O. Smith & R. H. Ennis (Eds.), Language and concepts in education. Chicago: Rand McNally, 1961.

Roper, S. S., Deal, T. E., & Dornbusch, S. M. Collegial evaluation of classroom teaching: Does it work? Educational Research Quarterly, 1976, 1, 56-66.

Rosenshine, B. Teaching behaviors and student achievement. London: National Foundation for Educational Research in England and Wales, 1971.

Rosner, B. The power of competency based teacher education: A report. Boston: Allyn & Bacon, 1972.

Rosner, B., & Kay, P. M. Will the promise of C/PBTE be fulfilled? Phi Delta Kappan, 1974, 55, 290-295.

Rubin, L. The societal future and teaching. In Cultural pluralism and social change. ISTE Report. Palo Alto, Ca.: Stanford Center for Research and Development in Teaching, 1976.

Ryans, D. G. Teacher behavior theory and research: Implications for teacher education. Journal of Teacher Education. 1963, 14, 274-93.

Ryle, G. The concept of mind. New York: Barnes & Noble, 1949.

Saettler, P. A history of instructional technology. New York: McGraw-Hill, 1968.

Sandoz, E. CBTE: The Days of Texas. Phi Delta Kappan, 1974, 55, 304-306.

Sands, L. B., & Gross, I. E. The history of education: A time line and scope of perspective. Cleveland: World Publication Company, 1967.

Schalock, H. D. A competency-based, field-centered systems approach to elementary teacher education. In J. L. Burdin and K. Lanzillotti, A reader's guide to the comprehensive models for preparing elementary teachers. ERIC Publication No. SP 003 421, 1969.

Schmieder, A. A. The last relatively complete tentative bibliography on competency based education. In W. R. Houston (Ed.), Exploring competency based teacher education. Berkeley, Ca.: McCutchan, 1974.

Schmieder, A. A., & Yarger, S. J. Teacher/teaching centering in America. Journal of Teacher Education, 1974, 25, 5-13.

Schutz, R. E. The nature of educational development. Journal of Research and Development in Education, 1970, 39-64.

Selden, D., & Darland, D. Teacher centers: Who's in charge? Paper prepared for the Teaching Leadership Training Institute of the National Center for the Improvement of Educational Systems, U. S. Office of Education, January 1972.

Shaftel, F. The Stanford evaluation of nine elementary teacher training models. Washington, D. C.: U. S. Office of Education, 1969.

Shavelson, R. J. What is the basic teaching skill? Journal of Teacher Education, 1973, 24, 144-151.

Shearron, G. F. Georgia portable schools and CBTE. In L. Lutonsky (Ed.), Portal schools. Teacher Corps Monograph for Grant No. OEG-0-71-3354(716), Washington, D. C.: U.S. Office of Education, 1973.

Silberman, C. E. Crisis in the classroom. New York: Random House, 1970.

Silberman, H., Coulson, J., Melaragno, R., & Newmark, G. Use of exploratory research and individualized tutoring techniques for the development of programming methods and theory. Final Report NDY Ed. Act Project 7-14-0000-181, Santa Monica, Ca.: System Development Corp., 1964.

Smith, B. O. A concept of teaching. Teachers College Record, 1960, 61, 229-241.

Smith, B. O., et al. Teachers for the real world. Washington, D. C.: American Association of Colleges for Teacher Education, 1969.

Smith, D. H., & Arnez, N. L. Inner city studies: Graduate training of teachers of the disadvantaged. Journal of Teacher Education, 1969, 20, 347-350.

Smith, E. D. The state of the states in teacher centering. Journal of Teacher Education, 1974, 25, 121-126.

Smith, W. L. Foreword. In Teacher National Field Task Force on the Improvement and Reform of American Education. Inside-out. Washington, D. C.: DHEW Publication No. (OE) 74-12002, 1974.

Snow, R. E. Theory construction for research on teaching. In R. M. W. Travers (Ed.). Second handbook of research on teaching. Chicago: Rand McNally, 1973.

Snow, R. E. Representative and quasi-representative designs for research on teaching. Review of Educational Research, 1974, 44, 269-291.

Southern Colorado State College Teacher Corps staff. Pueblo develops competency based education. In L. Lutonsky (Ed.), Portal schools. Teacher Corps Monograph for Grant No. OEG-0-71-3354(716). Washington, D. C.: U.S. Office of Education, 1973.

Spino, W. J., Berger, A. G., Tonges, M. J., & Abbott, A. R. B. (Eds.), Florida Center for Teacher Training Materials catalogues: FCTTM's annotated catalogue of teacher training materials. Coral Gables, Fl.: Florida Center for Teacher Training Materials, University of Miami, 1972.

Stanford Program on Teaching Effectiveness. Teacher training products: The state of the field. Stanford, Ca.: Stanford Center for Research and Development in Teaching, R&D Memo No. 116, 1974.

Steffenson, J. P. Foreword. In W. R. Houston (Ed.), Exploring competency based education. Berkeley, Ca.: McCutchan, 1974.

Stiles, Lindley J. Theories for teaching. New York: Dodd, Mead, & Co. 1974.

Stolurow, L. M. Teaching by machine. Washington, D. C.: U. S. Department of Health, Education and Welfare, OED, 1961.

Suppes, P. The place of theory in educational research. Educational Researcher, 1974, 3, 3-10.

SWRL Educational Research and Development. The SWRL reading program: activities and materials guide, Unit 1, Block 9. Los Alamitos, Ca.: The author, 1974.

Teacher National Field Task Force on the Improvement and Reform of American Education. Inside-out. Washington, D. C.: DHEW Publication No. (06) 74-12002, 1974.

Thoresen, C. E. Behavioral humanism. In C. E. Thoresen (Ed.), Behavior modification in education. Seventy-Second Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1973.

Thornbury, R. (Ed.). Teachers' centres. New York: Agathon Press, 1974.

Tikunoff, W. J., Berliner, D. C., & Rist, R. C. An ethnographic study of the 40 classrooms of the Beginning Teacher Evaluation Study known sample. San Francisco: Far West Laboratory for Educational Research and Development, 1975 (Technical Report #75-10-5).

Travers, R. M. W. (Ed.). Second handbook of research on teaching. Chicago: Rand McNally, 1973.

Trump, J. L. Images of the future. Washington, D. C.: National Association of Secondary School Principals, 1959.

Trump, J. L., & Baynham, D. Guide to better schools: Focus on change. Chicago: Rand McNally, 1961.

Turner, R. L. An overview of research in teacher education. In K. Ryan (Ed.), Teacher education, Seventy-Fourth Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1975.

Tyack, D. B. Historical perspectives on educational reform. In Final Report and Recommendations of the Summer Institute on the Improvement and Reform of American Education, 1974. Washington, D.C.: DHEW Publication No. (OE) 75-12008.

Tyler, R. W. Constructing achievement tests. Columbus: College of Education, Ohio State University, 1931.

U. S. Department of Health, Education and Welfare, Office of Education Bureau of Research. Implementing systems models for teacher education: Strategies for increasing feasibility. Washington, D. C.: USDHEW, 1971.

Wallen, N. E., & Travers, R. M. W. Analysis and investigation of teaching methods. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Ward, L. F. Applied sociology. New York: Macmillan, 1906.

Washington, E. Expert teacher action program. Belmont, Ca.: Fearon Publishers, 1971.

Whitehead, A. N. The aims of education. New York: Macmillan, 1929.

Wilkerson, D. Quality integrated education. IRCD Bulletin. 1965, 5. 1-2.

Woodring, P. The development of teacher education. In K. Ryan (Ed.), Teacher education. Seventy-Fourth Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1975.

Yarger, S. J. Highlights of the teacher center movement in American education: A discussion of a national survey. Paper presented at the annual meeting of the American Educational Research Association, Washington, D. C., April 1975.

Yarger, S. J., & Leonard, A. J. A descriptive study of the teacher center movement in American education. Syracuse Teacher Center Project Contract No. OEG-0-71-3353(715), sponsored by Teacher Corps and the National Center for the Improvement of Educational Systems. Washington, D. C.: U.S. Office of Education, 1974.

Zimmerman, E. H., & Zimmerman, J. The alteration of behavior in a social classroom situation. Journal of Experimental Analysis of Behavior, 1962, 5, 59-60.